FINAL

INSTALLATION RESTORATION PROGRAM

SITE INSPECTION REPORT
VOLUME I OF III

102nd AIR CONTROL SQUADRON
NORTH SMITHFIELD AIR NATIONAL GUARD STATION
SLATERSVILLE, RHODE ISLAND

SEPTEMBER 1995

Prepared For
AIR NATIONAL GUARD READINESS CENTER
ANDREWS AFB, MARYLAND 20331-6008

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. AGENCY USE ONLY (Leave blank)

2. REPORT DATE
September 1995

3. REPORT TYPE AND DATES COVERED
Site Inspection Report

4. TITLE AND SUBTITLE
Site Inspection Report, 102nd Air Control Squadron, North Smithfield Air National Guard Station, Slatersville, Rhode Island - Volume I of III

5. FUNDING NUMBERS

6. AUTHOR(S)
NA

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
Aneptek Corporation
209 West Central Street
Natick, Massachusetts 01760

8. PERFORMING ORGANIZATION REPORT NUMBER

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
ANGRC/CEVR
3500 Fetchet Avenue
Andrews AFB MD 20762-5157

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release;
distribution is unlimited

12b. DISTRIBUTION CODE

13. ABSTRACT (Maximum 200 words)

Site Inspection Report, 102nd Air Control Squadron, North Smithfield Air National Guard Station, Slatersville, Rhode Island, Volume I of III. This is the first volume of a three volume site inspection report. Three areas of concern (AOCs) were investigated under the Installation Restoration Program. A passive soil gas survey was conducted of the entire station. Soil and groundwater samples were collected and analyzed. Low level contamination of fuel-related compounds were detected below state action levels. No further action was recommended.

19960603 093

14. SUBJECT TERMS
Installation Restoration Program; Comprehensive Environmental Response, Compensation and Liability Act (CERCLA); Air National Guard; Site Inspection, Rhode Island Air National Guard; Slatersville, Rhode Island

15. NUMBER OF PAGES
350

16. PRICE CODE

17. SECURITY CLASSIFICATION OF REPORT
Unclassified

18. SECURITY CLASSIFICATION OF THIS PAGE
Unclassified

19. SECURITY CLASSIFICATION OF ABSTRACT
Unclassified

20. LIMITATION OF ABSTRACT
None

NSN 7540-01-280-5500

Standard Form 298 (Rev 2-89)

FINAL

INSTALLATION RESTORATION PROGRAM

SITE INSPECTION REPORT

102nd AIR CONTROL SQUADRON
NORTH SMITHFIELD AIR NATIONAL GUARD STATION
SLATERSVILLE, RHODE ISLAND

SEPTEMBER 1995

Prepared For

AIR NATIONAL GUARD READINESS CENTER
ANDREWS AFB, MARYLAND 20331-6008

Prepared By

ANEPTEK CORPORATION
209 West Central Street
Natick, Massachusetts 01760

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF FIGURES

LIST OF TABLES

LIST OF ACRONYMS

AGE	Aerospace Ground Equipment
AMSL	Above Mean Sea Level
Aneptek	Aneptek Corporation
ANG	Air National Guard
ANGRC	Air National Guard Readiness Center
ANGS	Air National Guard Station
ANGSIP	Air National Guard Site Investigation Protocol
AOC	Area of Concern
ARNG	Army National Guard
bgs	below ground surface
BTEX	Benzene, Ethylbenzene, Toluene, and Xylene
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
DCE	Dichloroethene
DOD	Department of Defense
DOT	Department of Transportation
eV	electron volt
ft^3/sec	cubic feet per second
FUDS	Formerly-used Defense Sites
GC	Gas Chromatograph
IAG	Interagency Agreement
IDW	Investigation Derived Wastes
IRP	Installation Restoration Program
MCLs	Maximum Contaminant Levels
μl	microliter
μg/kg	micrograms per kilogram
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
ml	milliliter
NEPA	National Environmental Policy Act
NERI	Northeast Research Institute LLC
NGB	National Guard Bureau
NPL	National Priorities List
O.D.	Outer Diameter
PA	Preliminary Assessment
PCBs	Polychlorinated biphenyls
PCE	Tetrachloroethene
PID	Photoionization Detector
PP13	Priority Pollutant 13
ppbv	parts per billion by volume
ppm	parts per million

P/S	Project/Site
PVC	polyvinyl chloride
QA/QC	Quality Assurance/Quality Control
RIANG	Rhode Island Air National Guard
RIDEM	Rhode Island Department of Environmental Management
SA	Site Assessment
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SI	Site Inspection
SVOCs	Semi-Volatile Organic Compounds
TCA	1,1,1 - Trichloroethane
TCE	Trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TPH	Total Petroleum Hydrocarbons
SI	Site Investigation
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
USTs	Underground Storage Tanks
VOCs	Volatile Organic Compounds

EXECUTIVE SUMMARY

A Site Inspection (SI) has been conducted at the 102nd Air Control Squadron, North Smithfield Air National Guard (ANG) Station, Slatersville, Rhode Island. The Station property is licensed through the Secretaries of the Army and the Air Force to the State of Rhode Island. A Preliminary Assessment (PA) of the North Smithfield ANG Station, completed by AEPCO in June 1993, and revised by the Air National Guard Readiness Center (ANGRC) in January, 1995 identified two Areas of Concern (AOCs) at the Station, the Former Generator Shed (north of Building P-13), and the Fenceline Behind the Motor Vehicle Maintenance Facility. The PA also identified a concern regarding the detection of trichloroethene (TCE), and 1,1,1-trichloroethane (TCA) in the Station's Supply Wells.

The ANGRC tasked Aneptek Corporation (Aneptek) to prepare an SI Work Plan and perform the field investigation at the North Smithfield ANG Station. The SI field investigation was conducted in accordance with the Final SI Work Plan (November 1994).

Based on a comprehensive review of all available, pertinent information and interviews with current and past Station employees, three AOCs were identified and investigated; the two identified in the PA, and one additional AOC. AOC-A is the approximate location of the Former Generator Shed (Building P-4) which housed four generators from 1978 through 1992. An estimate of one gallon per year of the generator fuel is believed to have been spilled in this area for a total of 14 gallons over the 14-year operating period.

Historical discharges to the ground surface of solvents and/or paints reportedly occurred from 1972 to 1978 along the fenceline located behind the Motor Vehicle Maintenance Facility (AOC B). Based on available information, an estimated one gallon per year was discharged to the ground surface over a 5-year period. A total volume of 25 gallons may have been dumped at this site.

AOC C, the Former Paint/Solvent Storage Building, reportedly was an area where small amounts of paint thinners were dumped from 1972 to 1974. Based on available information, an estimated one gallon per year may have been spilled over a 5-year period, and a total volume of 25 gallons may have been spilled.

An 80 point passive soil gas survey was conducted over the entire Station as a screening phase to help locate soil borings and monitoring wells. The soil gas survey identified five different areas where low to moderate levels of TCE and tetrachloroethene (PCE) were detected. The only other compounds detected by the soil gas survey were fuel-related compounds.

Soil borings were then advanced at each AOC and, based on the soil gas survey results, at two locations which showed the highest relative concentrations of TCE and PCE as well as four other areas identified as potentially containing elevated levels of fuel-related compounds. During the advancement of the soil borings, 40 subsurface soil samples were collected and screened on-site with a portable Gas Chromatograph (GC). Based on the GC screening results,

27 subsurface soil samples were submitted to an off-site laboratory for chemical analysis. Three surface soil samples were also collected and submitted for chemical analysis.

GC screening of the soils headspace identified total xylenes in 15 of the 40 samples screened ranging in concentration from 55 parts per billion by volume (ppbv) to 1430 ppbv. GC screening also detected TCA in one sample at a concentration of 142 ppbv and PCE in three samples at concentrations ranging from 572 ppbv to 1207 ppbv. None of the detections of PCE, TCE, or TCA were confirmed during laboratory analysis.

TPH was detected in 10 of 27 samples at concentrations ranging from 4.1 milligrams per kilogram (mg/kg) to 45 mg/kg. All TPH concentrations were well below the 100 parts per million (ppm) action level for TPH at the Station set by the RIDEM.

Four groundwater monitoring wells were installed across the Station. Samples were collected and submitted to the off-site laboratory for chemical analysis. For metals analyses, both filtered and non-filtered samples were collected and submitted to the off-site laboratory. No VOCs, SVOCs or TPH were detected. Inorganic compounds detected in unfiltered groundwater samples included chromium, copper, lead, and zinc. All concentrations detected were below either the Federal Maximum Contaminant Levels (MCLs), action levels promulgated under the Safe Drinking Water Act (SDWA) or the respective reference concentration for that compound (i.e., 3 x the concentration detected in the upgradient well).

During two rounds of groundwater elevation readings taken at the Station, it was noted that the elevation in one well, MW-01, increased over 1.0-foot while the elevation of the groundwater in MW-04, approximately 150 feet to the north, decreased 0.05 foot. This finding, coupled with the fact that the Station is located at the top of a topographic high, indicates radial flow may be occurring at the Station.

Low level contamination of fuel-related compounds appears to be present in various areas of the Station. All detections of TPH in soils at the Station were below the Action Level of 100 ppm. Detections of chromium, copper, lead, and zinc are all below either their regulatory limits or their respective reference concentrations, based on the background sample collected.

No further investigation is recommended at the Station due to the fact that no contaminants detected exceeded action levels in soil or groundwater.

SECTION 1.0

1.0 INTRODUCTION

Under the Installation Restoration Program (IRP) of the Air National Guard Readiness Center (ANGRC), Site Inspections (SIs) are undertaken to assess areas of possible contamination at hazardous material/waste disposal and spill sites on Air National Guard (ANG) installations. This SI Report has been developed for the 102nd Air Control Squadron, Rhode Island Air National Guard (RIANG) at the North Smithfield ANG Station (the Station) under Contract No. DAHA-90-93-0003 with the National Guard Bureau (NGB). This report describes the activities completed by Aneptek Corporation (Aneptek) during the SI.

This SI was conducted in full compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), as amended by Superfund Amendment and Re-authorization Act (SARA). Coordination with, and input from Federal and State regulatory agencies also fulfills requirements set forth in the National Environmental Policy Act (NEPA). The Defense Environmental Restoration Program (DERP) was established in 1984 to promote and coordinate efforts for the evaluation and cleanup of contamination at the Department of Defense (DOD) installations. On January 23, 1987, Presidential Executive Order 12580 was issued which assigned the responsibility to the Secretary of Defense for carrying out DERP within the overall framework of SARA and CERCLA. The IRP is focused on cleanup of contamination associated with past DOD activities to ensure that threats to public health and the environment are eliminated and to restore natural resources for future use. The ANGRC manages the IRP and related activities at all Air National Guard Installations.

1.1 Background

A Preliminary Assessment (PA) of the North Smithfield ANG Station was prepared by AEPCO in 1993 (AEPCO, 1993). The PA Report has since been revised by the ANGRC (ANGRC, 1995). The PA involved interviews with personnel familiar with the current and past operations at the Station as well as a review of all available, pertinent documents on the Station. The PA report concluded that there are two Areas of Concern (AOCs) at the Station, the Area of the Former Generator Shed and the Fenceline Behind the Motor Vehicle Maintenance Facility. The PA also stated that a third concern exists in that trichloroethene (TCE) and 1,1,1-trichloroethane (TCA) have been detected in the Station's water supply, however, a source area has not been identified (ANGRC, 1995). The PA recommended that a SI be performed to determine the presence or absence of contamination at the two identified AOCs, as well as to determine the presence of a TCE/TCA source area at the Station.

Periodic sampling and analysis of groundwater from the Station's water supply wells, required by the Department of the Air Force and Rhode Island Public Health Department, detected the presence of low level contamination by TCE and TCA. In the vicinity of the Station, residential drinking water wells have also been found to be contaminated with low levels of TCE and TCA. In response to Rhode Island Department of Environmental Management

(RIDEM) concerns regarding the potential presence of a source area which may be contributing to this contamination, the ANGRC has initiated this SI.

1.2 Purpose

The overall objective of this SI was to complete an investigation which conforms to the procedural requirements of the ANG IRP program, and which fulfills the requirements CERCLA as amended by SARA. Note that an SI is performed after a PA is completed. The PA utilizes information to establish a basis for identifying AOCs which require further investigation. The SI investigates the AOCs to determine whether or not further investigation under the IRP may be warranted.

The SI performed at the Station had two overall goals. The first goal was to determine the presence or absence of a source area located within the boundaries of the Station which may be contributing to contamination detected in the Station's water supply wells. The second, more general goal of this SI is to investigate areas where a release of hazardous compounds may have occurred.

1.3 Scope

The scope of this SI is limited to performing only those investigation activities needed to verify the presence or absence of contamination at the Station. Quantification of the full magnitude of contamination at the Station, if found, will occur during a subsequent Remedial Investigation effort.

This SI was initiated with a review of the information provided in the PA Report (AEPCO, 1993), and other available pertinent data. Based on this review, AOCs were identified and a field program was developed to support the collection of samples of various on-site media for chemical analysis. Analytical results of the chemical analysis of these samples were then evaluated to determine whether or not any further action at the Station is warranted.

The field program conducted at the Station consisted of performing a soil gas survey, advancing soil borings, installing groundwater monitoring wells, and collecting surface soil, subsurface soil, and groundwater samples for chemical analysis at an off-site laboratory. The first phase of the field program, the soil gas survey, involved the installation, retrieval, and analysis of 80 passive soil gas sampler tubes installed over the entire Station. The findings of this survey were used to determine the final locations from which the various media samples were collected. During the soil boring portion of the field program, 14 borings were advanced; two at each of the three AOCs, and eight additional soil borings in other areas of the Station corresponding to other potentially contaminated areas identified by the passive soil gas survey along with one background location. Four groundwater monitoring wells were installed at the Station to collect groundwater samples for chemical analysis. Also, three surface soil samples were collected as past disposal practices may have resulted in releases of contaminants to the ground surface at one AOC.

1.4 Methodology

This project was initiated during a kickoff/scoping meeting conducted at the Station on June 16, 1994 which included discussions with Station personnel and a site walk-over. Aneptek then performed a comprehensive review of all available pertinent data for the Station. In performing this task, Aneptek reviewed the following documents:

- "Installation Restoration Program Preliminary Assessment, 102nd Air Control Squadron, North Smithfield Air National Guard Station, North Smithfield, RI", prepared by AEPCO, Rockville, MD, June 1993.

- "Summary of Remedial Activities, Rhode Island Air National Guard Electronics Communication Training Facility", prepared by Trowe Protze Consulting Engineers, July 2, 1992.

- Various analytical reports for chemical analyses of the drinking water supply wells at the Station. Analyses performed by the Rhode Island Department of Health, Division of Laboratories, 1988.

- "Testing Summary, Private Well Program", Rhode Island Division of Drinking Water Quality, for years 1990, 1991, and 1993.

The field investigation portion of the SI was conducted from October through December 1994. The field program was conducted in accordance with the Air National Guard Site Investigation Protocol (ANGSIP) as well as the approved Final Site Inspection Work Plan (Aneptek, 1994a). Laboratory analyses were conducted at an off-site laboratory using United States Environmental Protection Agency (U.S. EPA) Level II protocols. No data validation was performed other than the laboratory's own internal sample analytical validation. All field work was performed in accordance with Federal Occupational Safety and Health Administration requirements (Chapter 29 Section 1900-1910 of the Code of Federal Regulations).

SECTION 2.0

2.0 INSTALLATION DESCRIPTION

2.1 Facility History

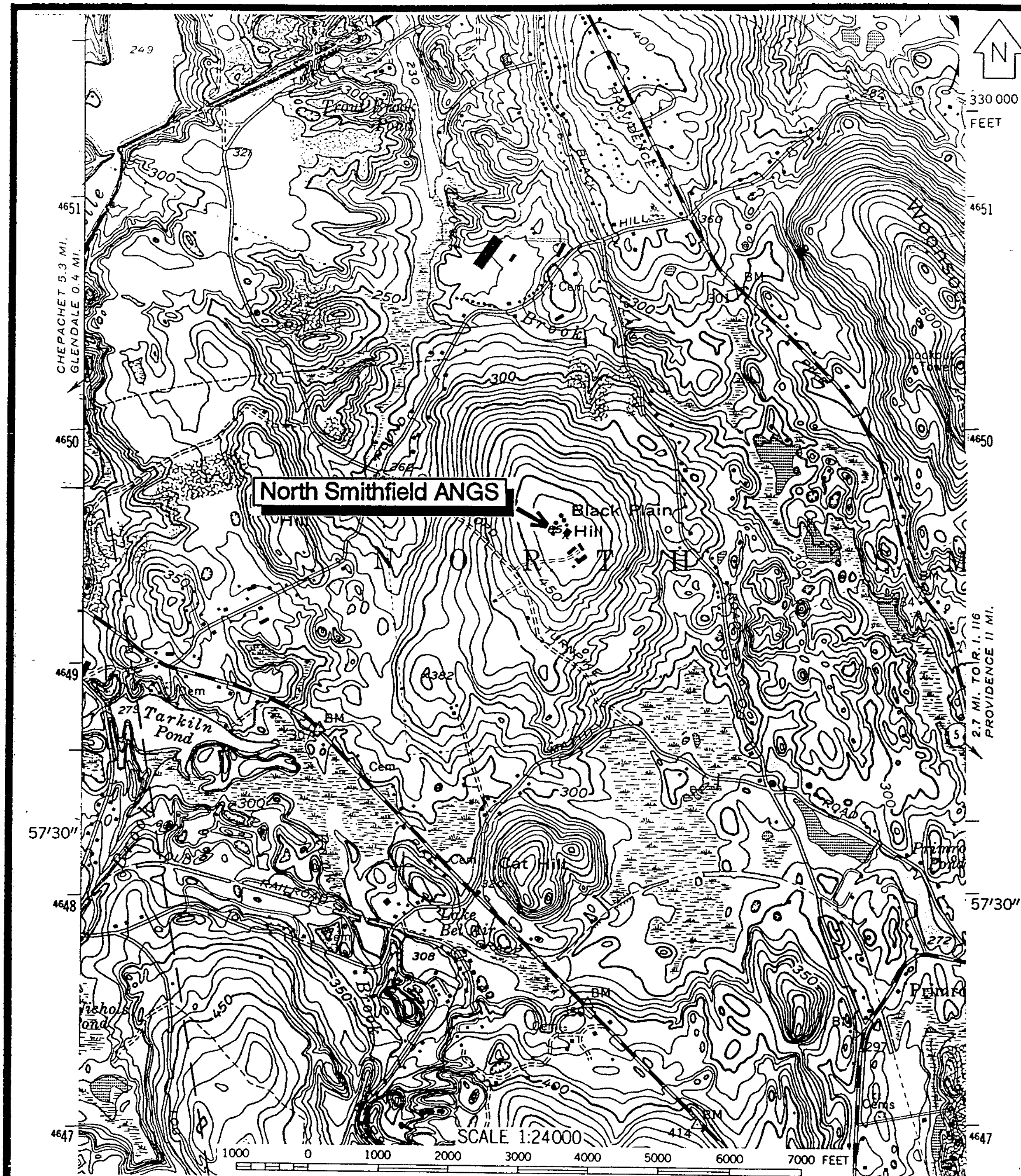
The North Smithfield ANG Station is located at 41° 58' 19" north latitude and 71° 34' 30" west longitude[1], approximately three and one half miles southwest of Woonsocket, Rhode Island (Figure 2-1). The Station is situated at the top of Black Plain Hill, and occupies 34.26 acres of land licensed through the Secretaries of the Army and Air Force to the State of Rhode Island (AEPCO,1993).

Information regarding past and present activities at the Station which may have involved the use, storage, disposal, or generation of hazardous wastes was obtained through a review of the PA, and discussions with ANG personnel familiar with past operations at the Station. Seven ANG personnel were interviewed; five current employees of the Station (at the time the PA was performed) and two retirees. Two of the personnel interviewed were associated with the Station in 1963 when the Army National Guard (ARNG) occupied the Station. The PA report identified Aerospace Ground Equipment (AGE) Maintenance, Vehicle Maintenance, Communication Maintenance/Secure Communication Maintenance, and Wire Maintenance as the operations which may have potentially used, generated or resulted in the storage of disposal of hazardous materials/wastes (AEPCO, 1993).

From the middle 1950s to the early 1970s, the U.S. Army maintained a radar station at this location in support of a Nike Missile Launch Site located to the west of the Station (AEPCO, 1993; Ramuglia, 1994a). In 1972, the RIANG took over occupancy of the Station. The Station recently completed a multi-phase construction and consolidation project in which 15 older buildings have been torn down and replaced with 10 new ones (Ramuglia, 1994a). Buildings that have been replaced include the Operations Building, Mess Hall, State Maintenance Building, Radar Maintenance, and the Mobile Computer Facility. Building P-1, Electronics Training Facility, is now called Building 102, Administration. Building P-12, Warehouse, has been enlarged with an addition and is now called Building 104, Warehouse. The radar system on the northern edge of the Station has been removed and a new building stands in its place, Building 108, Communications/Electronics Training Facility.

Construction details of the older buildings are not known and detailed information regarding containment features at each building is unavailable. However, it is known that floor drains are located in Building 106, Vehicle Maintenance Facility (formerly designated as Building P-11), and Building 110, AGE Maintenance (formerly designated as Building P-13). Floor drains from each of these buildings are connected to oil/water separators which are located

1. Project Note, latitude and longitude calculations, United States Geological Survey (USGS) 1975, 1:24,000 scale 7.5 Minute Topographic Map of Georgiaville, Rhode Island.



Source: U.S. Geologic 7.5 Minute Quandrangle, Georgiaville, R.I. 1975

FIGURE 2-1	NORTH SMITHFIELD ANGS SITE LOCATION MAP 102ND AIR CONTROL SQUADRON SLATERSVILLE, RHODE ISLAND	ANEPTEK CORPORATION Analytic, Environmental and Process Technologies

adjacent to each building. These floor drains and oil/water separators have been in use since the Station was built. In August 1993, the floor drains were plugged but the oil/water separators remained in the ground (Ramuglia, 1994a). Figure 2-2 depicts the Station prior to the new construction, and Figure 2-3 depicts the Station after the new construction. Figure 2-4 depicts the locations of all underground storage tanks (USTs) and the two oil/water separators at the Station. Tightness tests were performed on all tanks, with no failures observed (ANGRC, 1995). These USTs are scheduled to be removed and replaced with above ground storage tanks in the fall of 1995.

There are no open grass areas within the confines of the fenced-in area of the Station. There are a few small grass areas situated within the immediate surroundings of a few of the buildings. There are no marked roads at the Station. A small crushed rock service road which leads to the leach field is accessible through a locked gate (Ramuglia, 1994b).

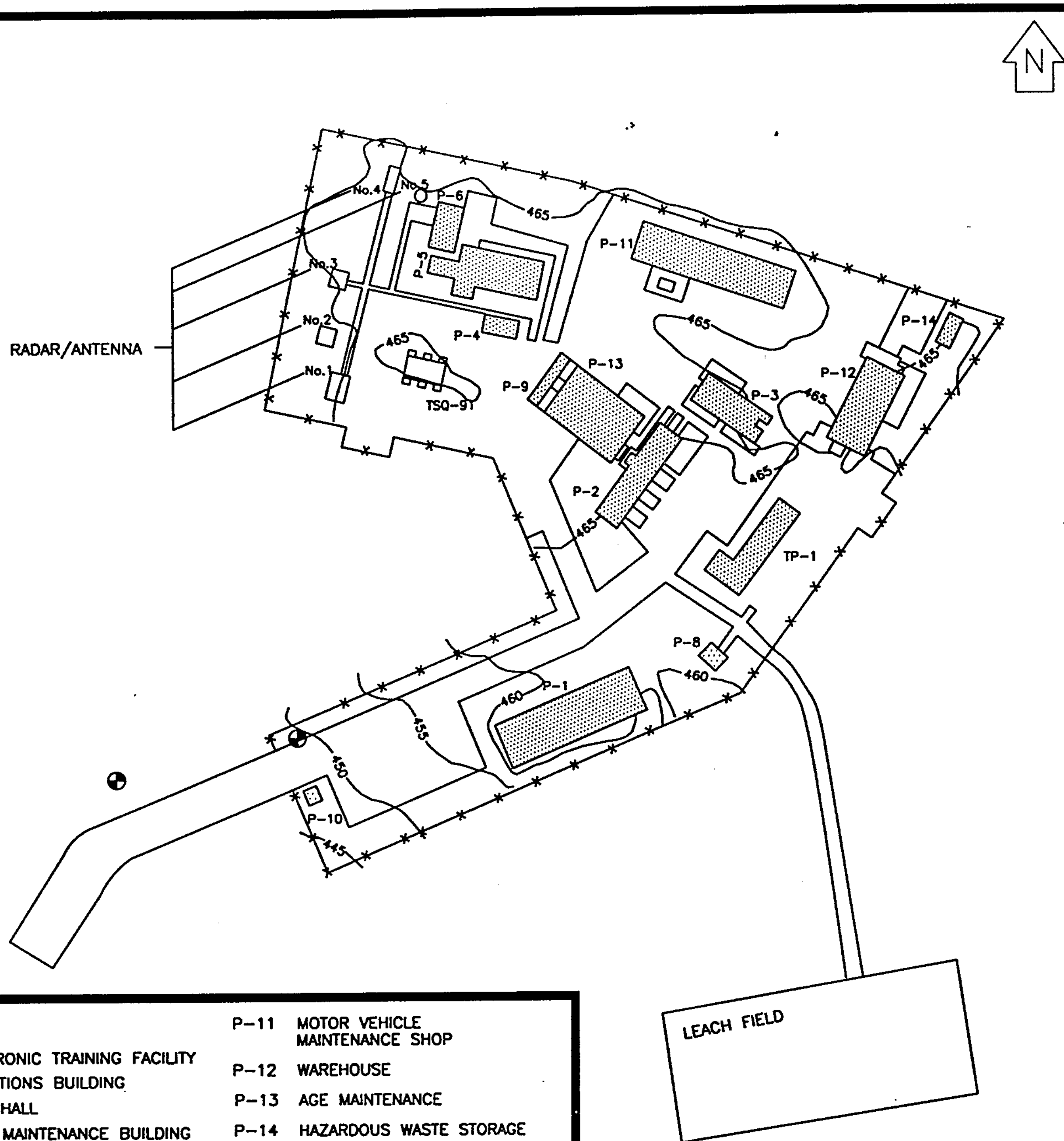
An NUS Corporation Target Memo, completed under the Formerly-used Defense Sites (FUDS) program, states that RIDEM personnel observed stained soil near transformers on the property (ANGRC, 1995). However, since the construction/consolidation project has since been completed, no visible signs of stained soils are currently present at the Station (Aneptek, 1994b).

The original leachfield installed by the Army in 1955 was removed in 1989 (ANGRC, 1995). This leachfield was excavated to a depth of 5 feet bgs. Excavated materials were disposed of in accordance with RIDEM requirements as solid waste. No unusual odors or signs of contamination were noted during the excavation (ANGRC, 1995).

Contaminated Soil Removal Action

During excavation within the footprint of what is now Building 108 (former Building P-5), as part of the construction and consolidation project, a petroleum odor and a sheen on standing water were noted (ANGRC, 1995; Trow Protze, 1992). The work was temporarily suspended and a Site Assessment (SA) was initiated which included the collection of soil and groundwater samples within and 15 feet outside of the excavation. Analysis of these samples found soils to be contaminated with total volatile organic compounds (VOCs), and total petroleum hydrocarbons (TPH) at levels from 0.1 to 5.1 milligrams per kilogram (mg/kg) and from 59 to 12,000 mg/kg, respectively. Generators which were parked adjacent to this area were determined to be the most likely source of this contamination as these generators reportedly leaked small amounts of diesel fuel (ANGRC, 1995). Jerry cans were used to collect any spillage which occurred. However, occasionally these cans would overflow if they were not emptied or if rainfall filled them up.

As part of the SA, the area of the former Mobile Computer Facility (adjacent to former Building P-5) was also determined to be a location at which generators were parked. These generators are suspected to have also released diesel fuel, similar to those described above. This area will be remediated in accordance with RIDEM requirements.



LEGEND

P-1	ELECTRONIC TRAINING FACILITY	P-11	MOTOR VEHICLE MAINTENANCE SHOP
P-2	OPERATIONS BUILDING	P-12	WAREHOUSE
P-3	MESS HALL	P-13	AGE MAINTENANCE
P-4	STATE MAINTENANCE BUILDING	P-14	HAZARDOUS WASTE STORAGE
P-5	ELECTRONICS MAINTENANCE	TSQ91	MOBILE COMPUTER FACILITY
P-6	RADAR MAINTENANCE	TP-1	ADMINISTRATION BLDG.
P-8	WATER PUMP STATION		FENCE WITH GATE
P-9	GENERATOR SHED		BEDROCK WATER SUPPLY WELL
P-10	GUARD HOUSE		
	BUILDING		
450	GROUND ELEVATION CONTOUR		

0 100' 200' 300'

APPROXIMATE SCALE

SOURCE: AEPCO, 1993

FIGURE 2-2

NORTH SMITHFIELD ANGS

BASE MAP – HISTORIC LAYOUT

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

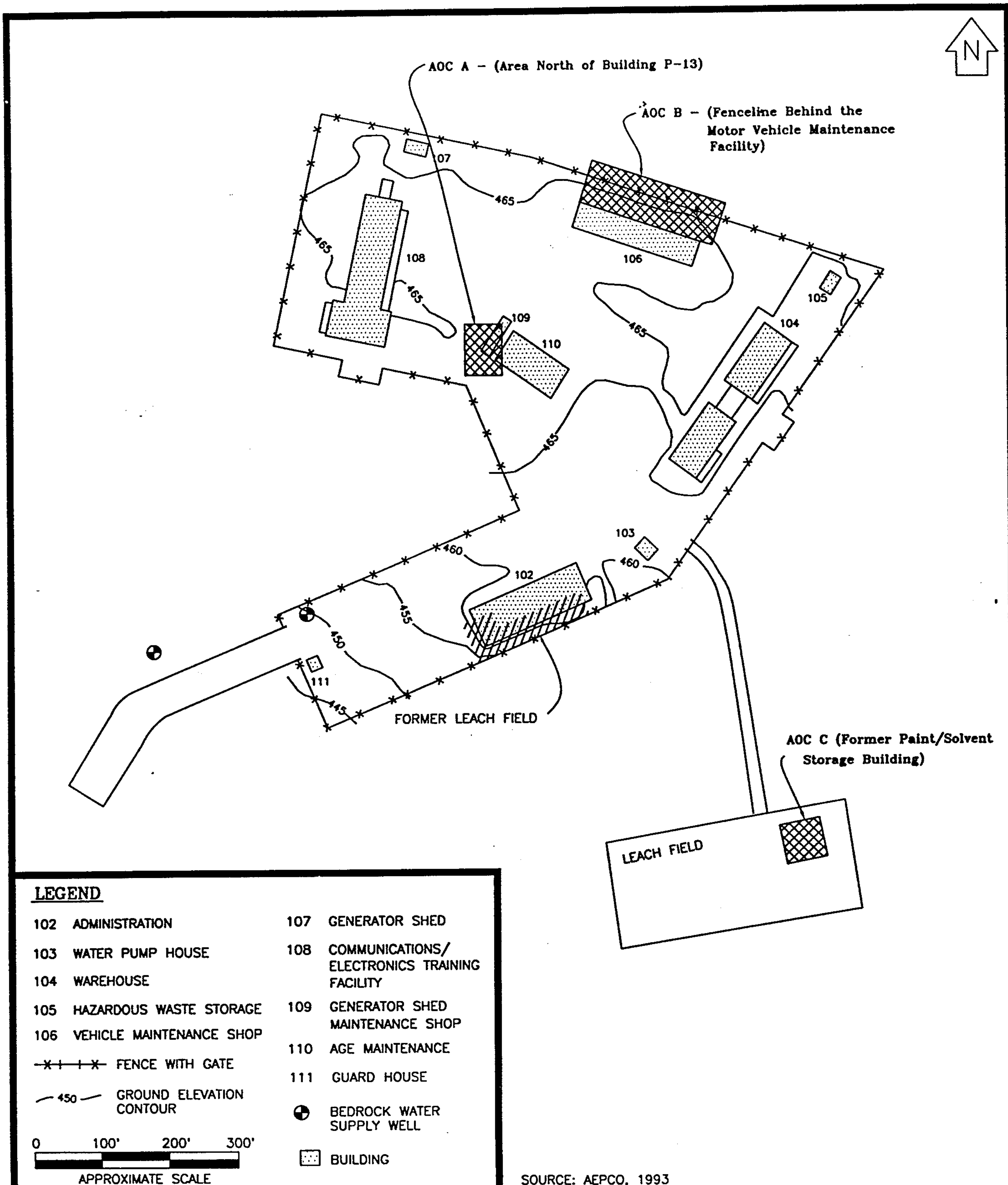


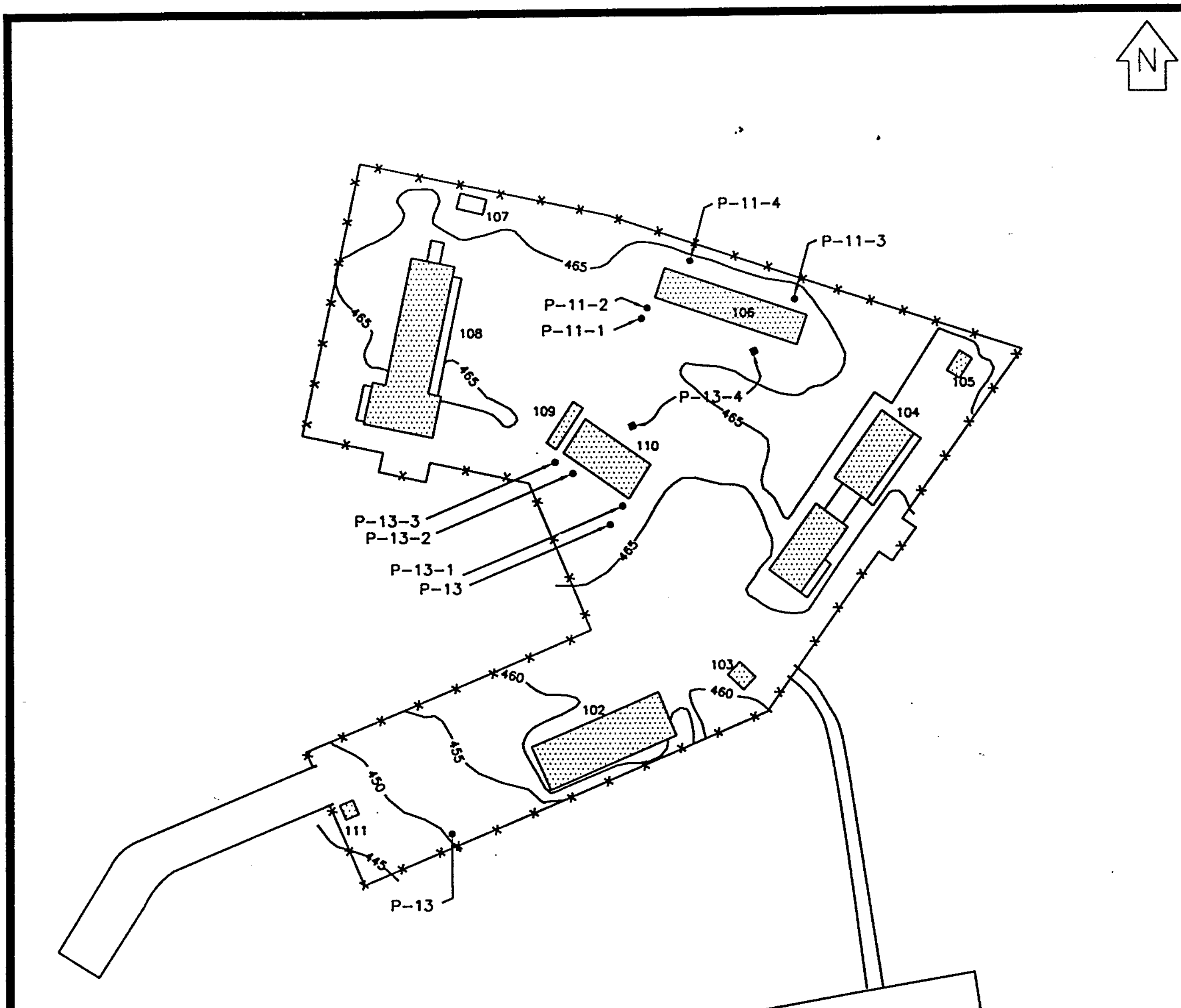
FIGURE 2-3

NORTH SMITHFIELD ANGS

BASE MAP – PRESENT LAYOUT

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies



LEGEND

TANK	BUILDING	SIZE	PRODUCTS
P-1	102	4,000	No. 2 Fuel Oil
P-11-1	106	10,000	Unleaded Gasoline/Diesel
P-11-2	106	12,000	Diesel Fuel
P-11-3	106	3,000	Waste Oil
P-11-4	106	10,000	No. 2 Fuel Oil
P-13	110	10,000	No. 2 Fuel Oil
P-13-1	110	12,000	JP-5 Fuel
P-13-2	110	500	Waste Oil
P-13-3	110	500	Waste Oil
P-13-4	106	200	Oil/Water Separator
P-13-4	110	200	Oil/Water Separator

■ Oil/Water Separator

• Underground Storage Tank

Building

—X—|—|—X— Fence with gate

— 450 — Ground Elevation Contour

0 100' 200' 300'

APPROXIMATE SCALE

SOURCE: AEPCO, 1993

FIGURE 2-4

NORTH SMITHFIELD ANGS
STORAGE TANKS AND
OIL/WATER SEPARATORS
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK
CORPORATION
Analytic, Environmental and Process Technologies

2.2 Site Descriptions

During the SI, Aneptek conducted several discussions with ANG and ARNG personnel. Based on the information obtained during these discussions, three AOCs (Figure 2-5) were identified at the Station. These AOCs included the two AOCs identified in the PA Report and a third AOC, identified during a walk over of the Station conducted as part of the kickoff/scoping meeting between ANGRC and Station personnel, Aneptek personnel, and RIDEM representatives. These were designated as AOCs A, B, and C and are described below.

2.2.1 Disposal/Spill Areas of Concern (AOC) Identification

AOC-A Area North of Building P-13

AOC-A is located in the north-central area of the Station, north of former Building P-13. This area is the approximate former location of Building P-4. Building P-4 housed four generators that were used to supplement electrical power to radar units operating at the Station (Ramuglia, 1994a). There is no available information on the construction of Building P-4, except that the generators were located on a concrete slab floor (Ramuglia, 1994a). Building P-4 was torn down during the Station's construction and consolidation phase. The area is currently clear and unpaved.

From 1978 through 1992, generators located behind Building P-13, the AGE Maintenance Building, were used to supplement electrical power for radar units operating at the Station. The generators were known to leak small amounts of diesel fuel while running and jerry cans were used to collect the spillage (Ramuglia, 1994a). Occasionally these cans overflowed due to lack of maintenance or rapid accumulation of rain water. An estimate of one gallon per year is believed to have been spilled in this area for a total of 14 gallons over the 14-year operating period.

Two areas of soil contamination were found in the vicinity of this AOC during the construction of Building 108, the Communications/Electronics Training Facility. It was determined that this contamination was related to a set of generators and a fuel distribution line not associated with the generators addressed in this SI (AEPCO,1993). RIDEM requested clean-up of all contaminated soil above 100 parts per million (ppm) of TPH. Trow Protze Consulting Engineers completed a SA in July of 1992 (Trow Protze, 1993). The Station removed contaminated soil surrounding the foundation footings of Building 108 in June 1994.

AOC-B Fenceline Behind the Motor Vehicle Maintenance Facility

The current Motor Vehicle Maintenance Facility, Building 106, was also the Motor Vehicle Maintenance Facility prior to the new construction, and was designated Building P-11 (AEPCO,1993). The Motor Vehicle Maintenance Facility is located on the northeastern side of the Station and is a one-story building with a number of bays to service vehicles. The fenceline is located approximately 30 feet north of and parallel to the Motor Vehicle Maintenance Facility.

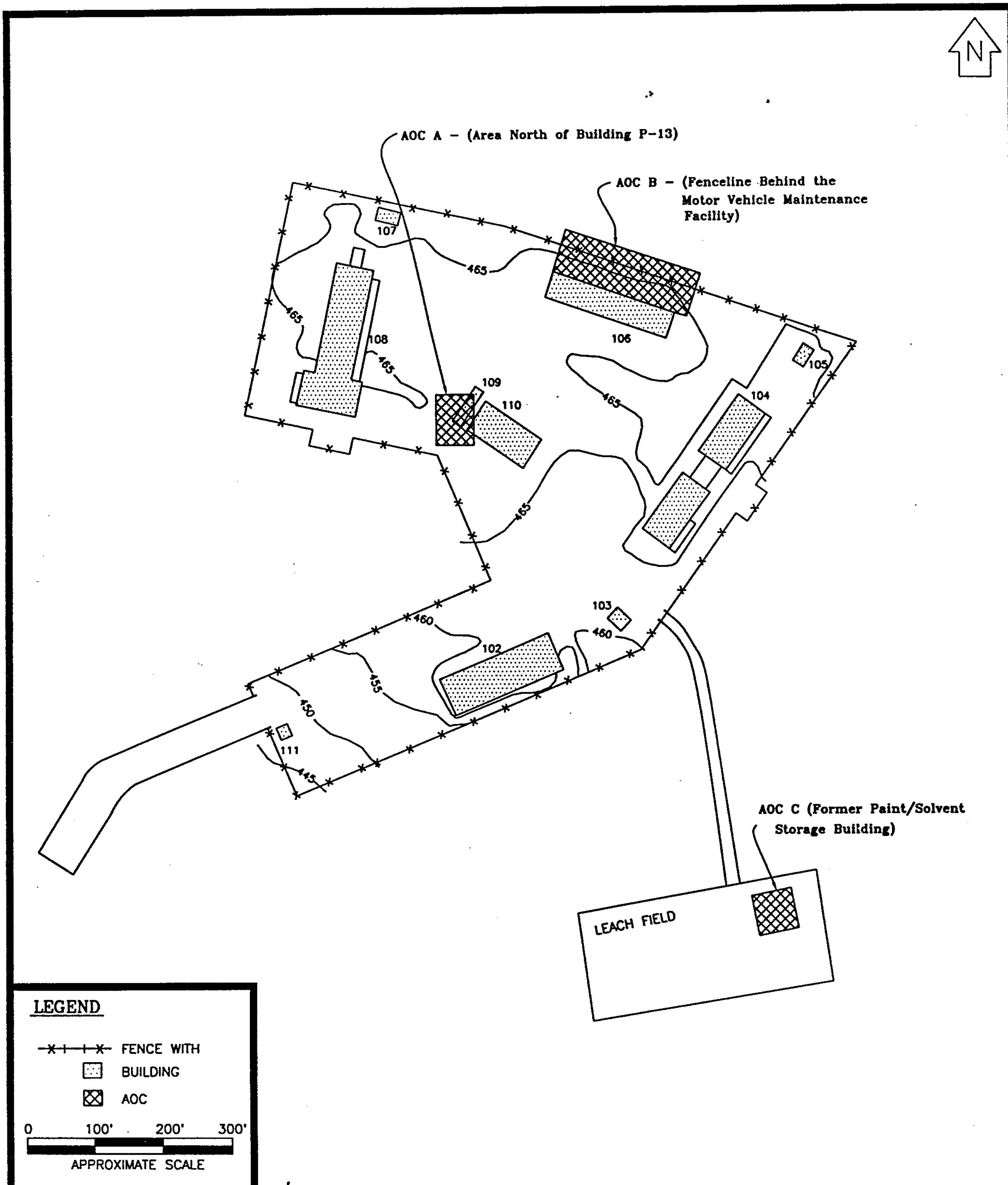


FIGURE 2-5

NORTH SMITHFIELD ANGS

AOCs A - C

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

From 1972 to 1978, paint thinners were used at Building 106. Sources indicate that toluene was used as the primary thinner. Based on interviews with Army and Air National Guardsmen, historical discharge of solvents and/or paints was conducted along the fenceline located behind the Motor Vehicle Maintenance Facility. Based on available information, an estimated one gallon per year was discharged to the ground surface over a 5-year period. A maximum total volume of 25 gallons may have been dumped at this site.

AOC-C Former Paint/Solvent Storage Building

The Former Paint/Solvent Storage Building was used to store paints and solvents. Sources have indicated that from 1972 to 1974 small amounts of paint thinners were dumped next to the building. Based on available information, an estimated one gallon per year may have been spilled over a 5-year period, and a total volume of 25 gallons may have been spilled.

2.2.2 Other Pertinent Information

Station's Supply Wells

Past and current drinking water sampling has revealed the presence of TCE and TCA in both of the Station's two water supply wells. One of the goals of this SI was to evaluate the shallow aquifer across the Station for potential TCE and TCA contamination. The SI also evaluated the potential presence of a source area of TCA/TCE within the Station's boundary. The exact source of this contamination is unknown.

Nearby U.S. EPA National Priorities List Sites

Two sites in the immediate vicinity of the Station are listed on U.S. EPA's National Priorities List (NPL). These sites are operated by Landfill and Resource Recovery, Inc. and Western Sand and Gravel. TCE has reportedly been detected in both the soils and groundwater at these sites. Contaminants detected in the air at these sites were several VOCs, including carbon tetrachloride, chloroform, and benzene. Soils at these sites were also found to be contaminated with VOCs as well as phenols. Similarly, groundwater at these sites were determined to be contaminated with VOCs, polychlorinated biphenyls (PCBs), arsenic and lead. These contaminants have reportedly migrated from those sites through surface water and groundwater pathways.

SECTION 3.0

3.0 ENVIRONMENTAL SETTING

3.1 Meteorology

Rhode Island's climate is characterized by a wide range of daily temperatures throughout the year and significant changes in the weather over short time periods. Although there are great differences in temperature in the same season of different years, the average winter and summer temperatures are 30°F and 70°F, respectively (ANGRC, 1995).

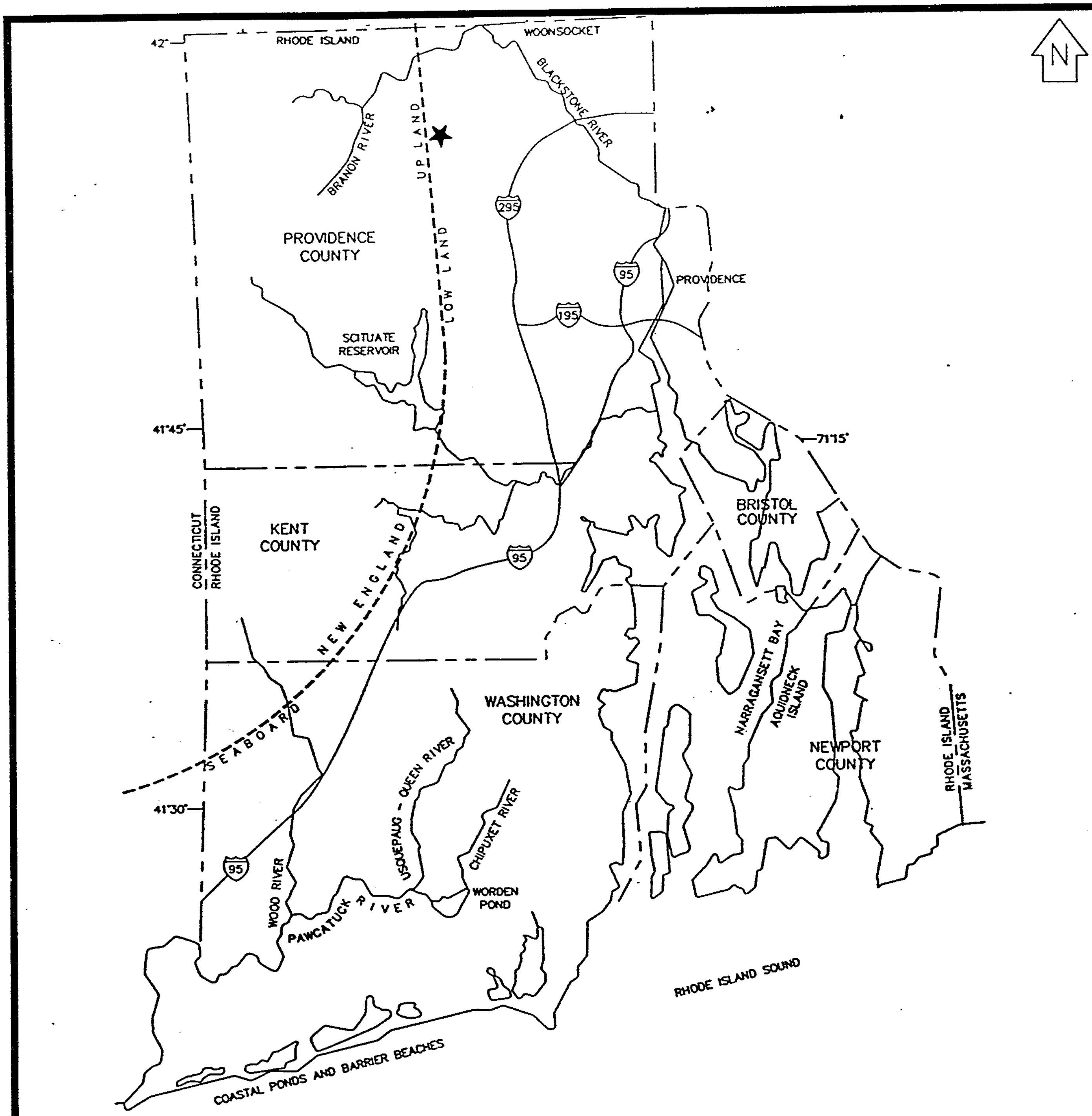
The annual precipitation averages between 42 and 46 inches, equally distributed throughout the year (ANGRC, 1995). Net precipitation (annual precipitation - mean lake evaporation) is 18 inches per year (ANGRC, 1995). The two-year, 24-hour rainfall in the vicinity of the Station is approximately 3.4 inches (U.S.DOC, 1961).

3.2 Regional Geology

Rhode Island contains two physiographic provinces, the New England Uplands and the Seaboard Lowlands (Figure 3-1). The eastern and southeastern portions of Rhode Island fall within the Seaboard Lowlands. This province consists of the low-lying coastal area, which borders Connecticut, Rhode Island, and Massachusetts. The New England Uplands province consists of hilly terrain inland of the Seaboard Lowlands. The northwestern and western portions of the state are within this province and consist of hilly terrain with elevations reaching 600 to 700 Above Mean Sea Level (AMSL).

Rhode Island is in the Appalachian Mountain chain which extends from Alabama to Newfoundland. These mountains were formed by numerous periods of mountain building (orogenic events) during the Paleozoic and Mesozoic Periods. Orogenic events were caused by continents colliding, splitting apart, and numerous small land masses colliding with continents. These events created a collage of fault-bounded rock bodies, each with a distinct geological history (a terrain). Eastern Rhode Island is part of the Avalon Zone, consisting of terrains which occur from the eastern Carolinas to eastern-most Newfoundland. The majority of western Rhode Island consists of Esmond Terrain. This terrain is characterized predominantly by plutonic (crystalline) rocks. Eastern Rhode Island consists of non-terrain flat-lying Cretaceous and Lower Tertiary sediments deposited after the orogenic events ceased (Figure 3-2).

The bedrock (which is part of the Avalon Zone) consists predominantly of plutonic (crystalline) and metamorphic rocks with ages from Precambrian to Late Paleozoic. The Station is underlain by a stratified rock which was metamorphosed into a feldspathic quartz-biotite gneiss (The Woonasquatucket Formation) by intruding granitic plutons. The metamorphism is thought to have occurred in the Late Precambrian (620 million Years Before Present).



LEGEND

----- PHYSIOGRAPHIC BOUNDARY SHOWS BOUNDARY BETWEEN NEW ENGLAND UPLAND AND SEABOARD LOWLAND PHYSIOGRAPHIC SECTIONS

★ N. SMITHFIELD ANGS

SOURCE: ANGRC, 1995

FIGURE 3-1

NORTH SMITHFIELD ANGS
PHYSIOGRAPIC PROVINCES
OF RHODE ISLAND
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

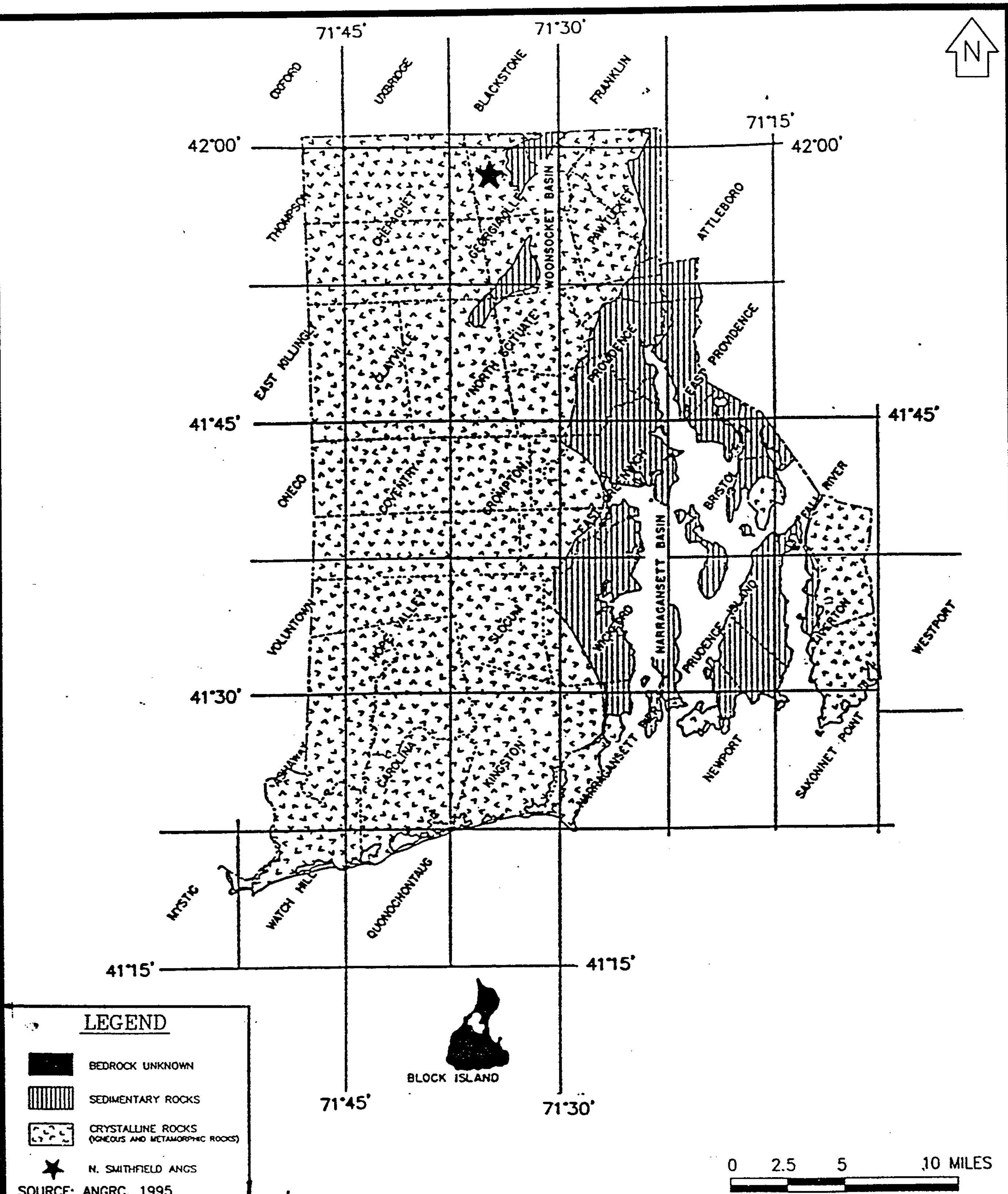


FIGURE 3-2

NORTH SMITHFIELD ANGS
GENERALIZED BEDROCK MAP
OF RHODE ISLAND
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK
CORPORATION
Analytic, Environmental
and Process Technologies

The bedrock is overlain by glacial deposits of varying thickness (Figure 3-3). The deposits may be divided into stratified glacial deposits and unstratified, unsorted glacial till. The stratified deposits occupy the current and Pleistocene River valleys and are up to 200 feet thick. The bedrock outside the river valleys is overlain by unsorted glacial till, predominantly in ground moraine deposits (Figure 3-3). The moraines range up to 20 feet thick. Many hills composed of competent rock (i.e., plutonic and metamorphic) were deformed by the overriding glaciers. The northern slopes were gently scoured and covered by a veneer of glacial material. Bedrock on the southern slopes was plucked away by the glacial activity creating steep cliffs where no glacial material was deposited. Black Plain Hill, where the Station is located, is typical of these ellipsoidal hills. A thin veneer of glacial moraine material is found on a gentle northern slope, but none of this material is found on the steep southern slope.

3.3 Local Geology

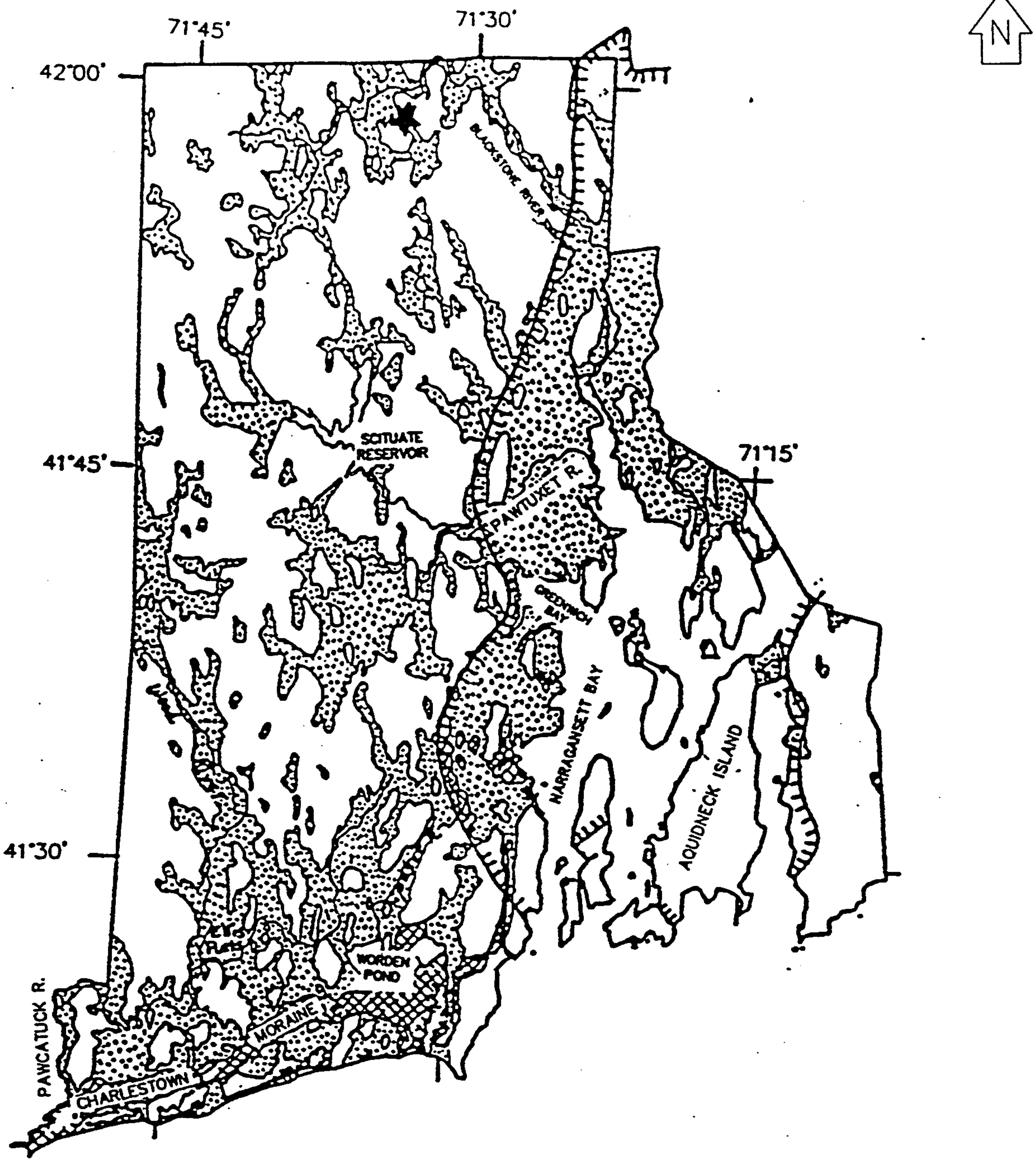
The Station is located on the near-level summit of Black Plain Hill. Black Plain Hill, as well as the other hilly terrain in this section of Rhode Island, was produced by a combination of stream erosion, and glacial erosion and deposition, superimposed on an eroded Precambrian bedrock surface. The north-northwest fold direction in the underlying bedrock is probably responsible for the similar orientation of Black Plain Hill's topography. The relatively steep south slope and the gentle north slope suggests that the Precambrian structure of Black Plain Hill was modified by glacial erosion and deposition, as glaciation advanced from north to south. Preglacial stream erosion is probably responsible for the orientation of the surrounding valleys (ANGRC, 1995). Figure 3-4 presents the local geologic map of the area.

3.4 Stratigraphy

As shown in Figures 3-5 and 3-6, the bedrock underlying Black Plain Hill includes feldspathic quartz biotite gneiss from the Precambrian Woonasquatucket Formation (southeastern portion of hill) and quartzite from the Precambrian Blackstone Series (northwestern portion of hill) (ANGRC, 1995).

Overlying the bedrock on Black Plain Hill are two tills -- a lower, hard, compact, and nearly impermeable, clayey till; and an upper, more permeable and friable sandy till (Figure 3-6) (ANGRC, 1995). The upper till tends to be thickest over the northern slope and thins over the south slope. The lower till may represent deposition during glacial advance while the upper till may have been deposited during glacial retreat and melting. Finally, overlying the till deposits, primarily on the north slope, is wind-blown silt, up to 5 feet thick (ANGRC, 1995).

In addition to glacial tills, fluvio-glacial deposits (kame terrace deposits) occur at the base of Black Plain Hill. The kame terrace deposits bury pre-glacial valleys lying in an area between Black Plain Hill and Slatersville Reservoir. By contrast to the unstratified tills on Black Plain Hill, the kame terrace gravels and sands are graded and well sorted (ANGRC, 1995).



LEGEND

STRATIFIED DRIFT

TILL

MIXED DEPOSITS OF TILL AND STRATIFIED DRIFT (TYPICAL)

N. SMITHFIELD ANGS

BEDROCK

NARRAGANSETT BASIN BOUNDARY—WITHIN THE AREA OF THIS STRUCTURAL BASIN, BEDROCK IS PRIMARLY SEDIMENTARY AND METAMORPHOSED SEDIMENTARY ROCK. OUTSIDE THIS AREA, BEDROCK IS PRIMARILY CRYSTALLINE ROCK.

SOURCE: ANGRC, 1995

FIGURE 3-3

NORTH SMITHFIELD ANGS

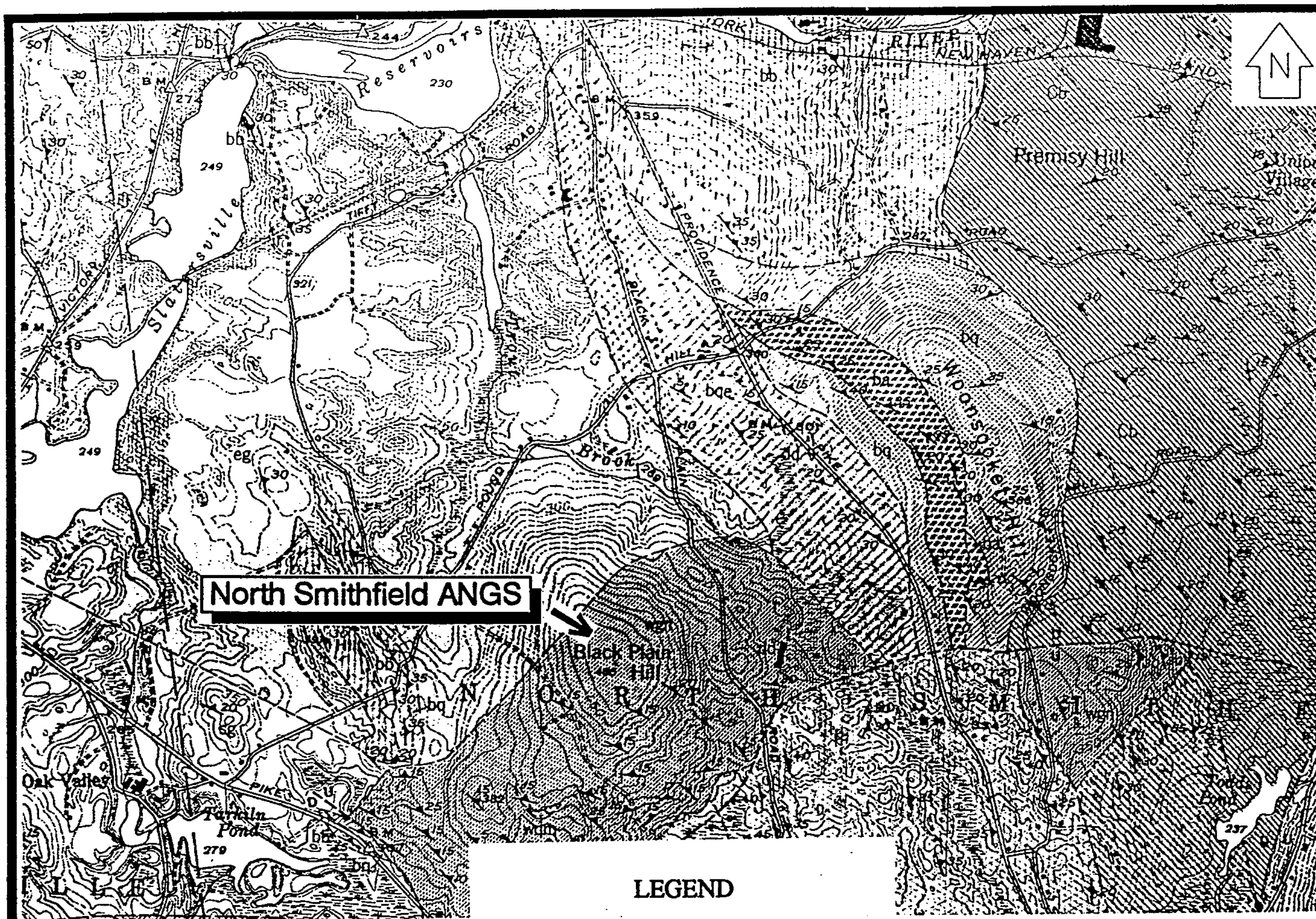
GENERALIZED SURFICIAL GEOLOGIC MAP OF RHODE ISLAND

102ND AIR CONTROL SQUADRON

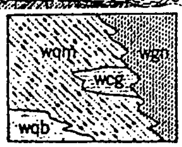
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION

Analytic, Environmental and Process Technologies



LEGEND



Woonasquatucket formation

Feldspathic quartz-biotite gneiss (wgn), *gray, thinly and irregularly banded, medium-grained, composed of microperthite (35 to 40 percent), albite (25 to 35 percent), quartz (20 to 30 percent), biotite (1 to 3 percent), and traces of muscovite, calcite, epidote, garnet, and magnetite. Feldspathic conglomerate* (wcg); *layers of pebbles composed of quartzite and granite, in a matrix of feldspathic quartz-muscovite schist, with interbedded quartz-biotite schist and quartzite.*

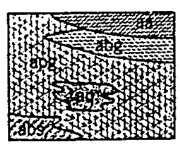
sg

Scituate granite gneiss

Coarse-grained gneissic rock composed of orthoclase (20 to 45 percent), albite (20 to 30 percent), quartz (25 to 30 percent), biotite (2 to 5 percent), and traces of muscovite, magnetite, and apatite.

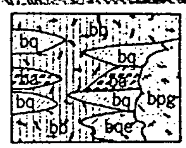
Esmond granite

Granitoid rock, medium- to coarse-grained, composed of microperthite (40 to 50 percent), albite (20 to 30 percent), quartz (20 to 25 percent), muscovite (0 to 3 percent), biotite (0 to 3 percent), and traces of chlorite, epidote, calcite, magnetite, and allanite.



Absalona formation

Porphyroblastic biotite gneiss (apg), *dark gray to black, medium- to coarse-grained, containing inclusions of quartz-biotite schist and quartz-epidote nodules. Rock is composed of albite (25 to 40 percent), microperthite (15 to 30 percent), quartz (10 to 25 percent), biotite (10 to 20 percent), amphibole (1 to 2 percent), chlorite (5 to 10 percent), and traces of epidote, garnet, magnetite, allanite, rutile, sphene, zircon, apatite, and calcite. The porphyroblasts are of microperthite and albite.*



Blackstone series

Feldspathic quartz-epidote schist (bqe), *light gray, fine- to medium-grained, composed of quartz (40 to 50 percent), albite (15 to 25 percent), epidote (10 to 15 percent), biotite (5 to 15 percent), muscovite (5 to 10 percent), chlorite (2 to 10 percent), and traces of garnet, apatite, and magnetite. Quartzite* (bq), *light gray, medium-grained, locally cross-bedded, composed of quartz (70 to 80 percent), albite (20 to 30 percent), and traces of muscovite, magnetite, and zircon. Amphibole schist* (ba), *dark gray or gray green, fine-grained, locally amygdaloidal, composed of green amphibole (20 to 60 percent), quartz (10 to 35 percent), albite (15 to 25 percent), epidote (10 to 15 percent), biotite (5 to 15 percent), muscovite (5 to 10 percent), and traces of chlorite, garnet, and magnetite. Quartz-biotite schist* (bb), *gray, fine- to medium-grained, composed of quartz (50 to 60 percent), biotite (15 to 20 percent), albite (10 to 15 percent), epidote (5 to 10 percent), and traces of chlorite, garnet, and magnetite. Porphyroblastic albite gneiss* (bpg), *gray, coarse-grained, composed of granular quartz (35 to 40 percent), albite (30 to 40 percent), microperthite (15 to 30 percent), biotite (5 to 10 percent), muscovite and phlogopite (5 to 10 percent), and traces of epidote, apatite, garnet, rutile, and magnetite. The porphyroblasts are of albite and microperthite. This rock is equivalent to Quinn's quartz-feldspar gneiss* (mbg) *of the Pawtucket quadrangle, 1949.*

Scale 1:31,680

1 ½ 0 1 Miles

Contour interval 10 feet

Datum is mean sea level

Source: Geologic Map of the Georgiaville Quadrangle, Rhode Island Bedrock Geology, USGS, 1952

FIGURE 3-4	NORTH SMITHFIELD ANGS BEDROCK GEOLOGIC MAP 102ND AIR CONTROL SQUADRON SLATERSVILLE, RHODE ISLAND	ANEPTEK CORPORATION Analytic, Environmental and Process Technologies

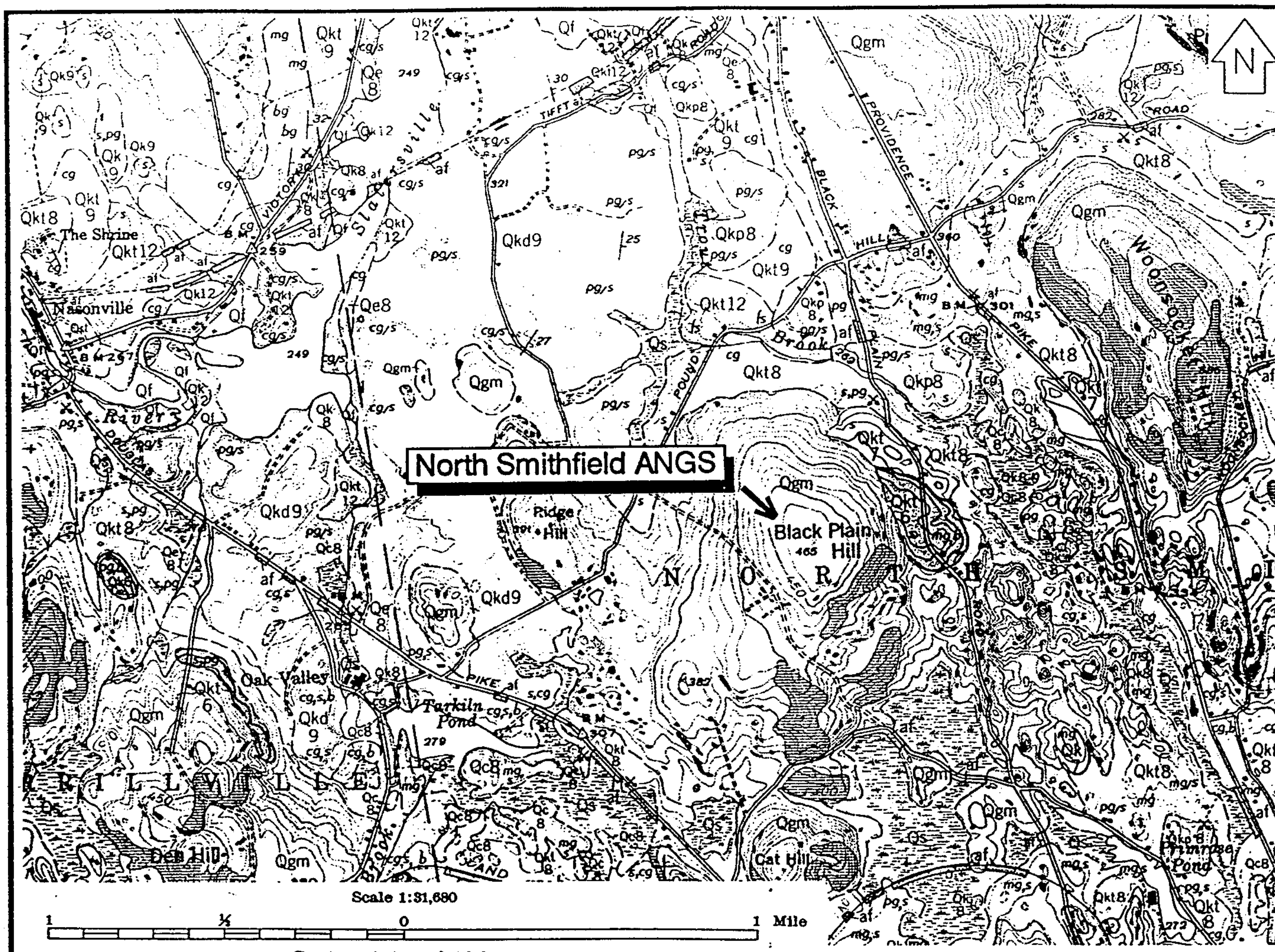
Tentative age assignment	Metasedimentary	Igneous
Triassic (?)		Diorite and diabase dikes
Carboniferous	Bellingham conglomerate	Pegmatite, aplite and quartz veins (not mapped); may be post–Carboniferous
Devonian (?) or earlier		Fine–grained granite Esmond granite Metadiabase dikes Scituate granite gneiss
Pre–Cambrian (?)	Blackstone series Woonasquatucket formation Absalona formation Nipsachuck gneiss	Porphyritic metadiorite (?)

SOURCE: RICHMOND, 1952

FIGURE 3-5

NORTH SMITHFIELD ANGS
GENERAL STRATIGRAPHIC COLUMN OF THE ROCKS OF THE GEORGIAVILLE QUANDRANGLE
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies



Contour interval 10 feet
Datum is mean sea level

EXPLANATION

Qkt12
Qkt9
Qkt8

Qk9
Qk8

Qs

Swamp deposits
Organic debris mixed with sandy to silty mineral matter; locally pealy; 6 inches to 4 feet thick. Boulders project through those deposits underlain by till.

Qc8

Crevasse filling
Pebble to cobble gravel and sand, poorly sorted, local thin layers of silt and clay

Qkp8

Kame plain
Few feet of sandy gravel overlying well-sorted coarse sand with a little gravel

Qkd9

Kame delta
Thin sandy well-sorted gravel overlying coarse or fine sand

Kame terrace
Pebble to cobble gravel and sand, fairly well sorted

Kame
Pebble to cobble gravel and sand, poorly sorted with thin layers of silt and clay

Qf

Flood plain
Silty alluvium underlain by sand and gravel

Deposits from glacial meltwaters
Numbers following letter symbols indicate sequence of deposition of these outwash groups; those groups not classified chronologically are designated by X.

Qgm

Ground moraine deposits
Gray, sandy, friable upper till. Areas of unusually abundant boulders on the surface of the morainal deposits are shown by dotted overprint.

Source: Surficial Geology, Georgiaville Quadrangle, R.I. 1953

FIGURE 3-6

NORTH SMITHFIELD ANGS
SURFICIAL GEOLOGY MAP
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK
CORPORATION
Analytic, Environmental and Process Technologies

3.5 Station Soils

The soil at the Station is classified as Paxton-Urban land complex due to full development. The complex consists of well drained Paxton soils and areas of urban land. Urban land consists of areas covered by streets, parking lots, buildings, and other structures. The top 5 inches of the Paxton soils are dark grayish brown fine sandy loam. The subsoil, from 5 to 23 inches, is brown and yellowish brown fine sandy loam. The substratum, between 23 and 60 or more inches, is light brownish gray, yellowish brown and grayish brown fine sandy loam. The Paxton soils have the following characteristics:

Depth (in)	USSC Class	Permeability (in/hr)	pH	Erosion Potential
0-5	SM-SC	0.6-6.0	4.5-6.5	slight
5-23	SM-SC	0.6-6.0	4.5-6.5	slight
23-60	SM-SC	<0.2	4.5-6.5	slight

Geotechnical soil borings were made in the northwestern and southeastern portions of the Station in the vicinity of Building 106 for development and engineering design. These locations yielded fine sand with some silt from the surface to 10 to 15 feet and some gravel and cobbles from 2 to 10 feet below the surface. Boring logs are in Appendix C.

3.6 Hydrology

The North Smithfield ANG Station is located on the groundwater divide between the Branch River Basin to the north and the Woonsaquatucket River Basin to the south. The Branch River Basin drains 91 square miles, 79 in Rhode Island and 12 in Massachusetts (AEPCO,1993). The Woonasquatucket River Basin drains entirely within Rhode Island. Figure 3-7 depicts general stormwater drainage pathways at the Station.

Surface water from the northern sections of the site drain by overland flow approximately 0.3 to 0.75 mile at which point it enters into Trout Brook or into the surrounding wetlands (USGS, 1975). From this point it flows approximately 0.5 to 1.4 miles in a northerly direction into the Slatersville Reservoir.

Surface water from the southwestern section of the site also flows into the Slatersville Reservoir by way of wetland areas which drain into Tarkiln Pond. This represents a distance of approximately 1.5 miles from the site to the edge of the wetlands. Surface water then travels in a west northwest direction approximately 0.6 miles through the wetland area before entering the eastern end of Tarkiln Pond. After flowing through Tarkiln Pond, the surface water pathway follows a northerly direction approximately 1.25 miles before draining into the southern section of the Slatersville Reservoir. As shown in Figure 3-8, surface water then flows in a

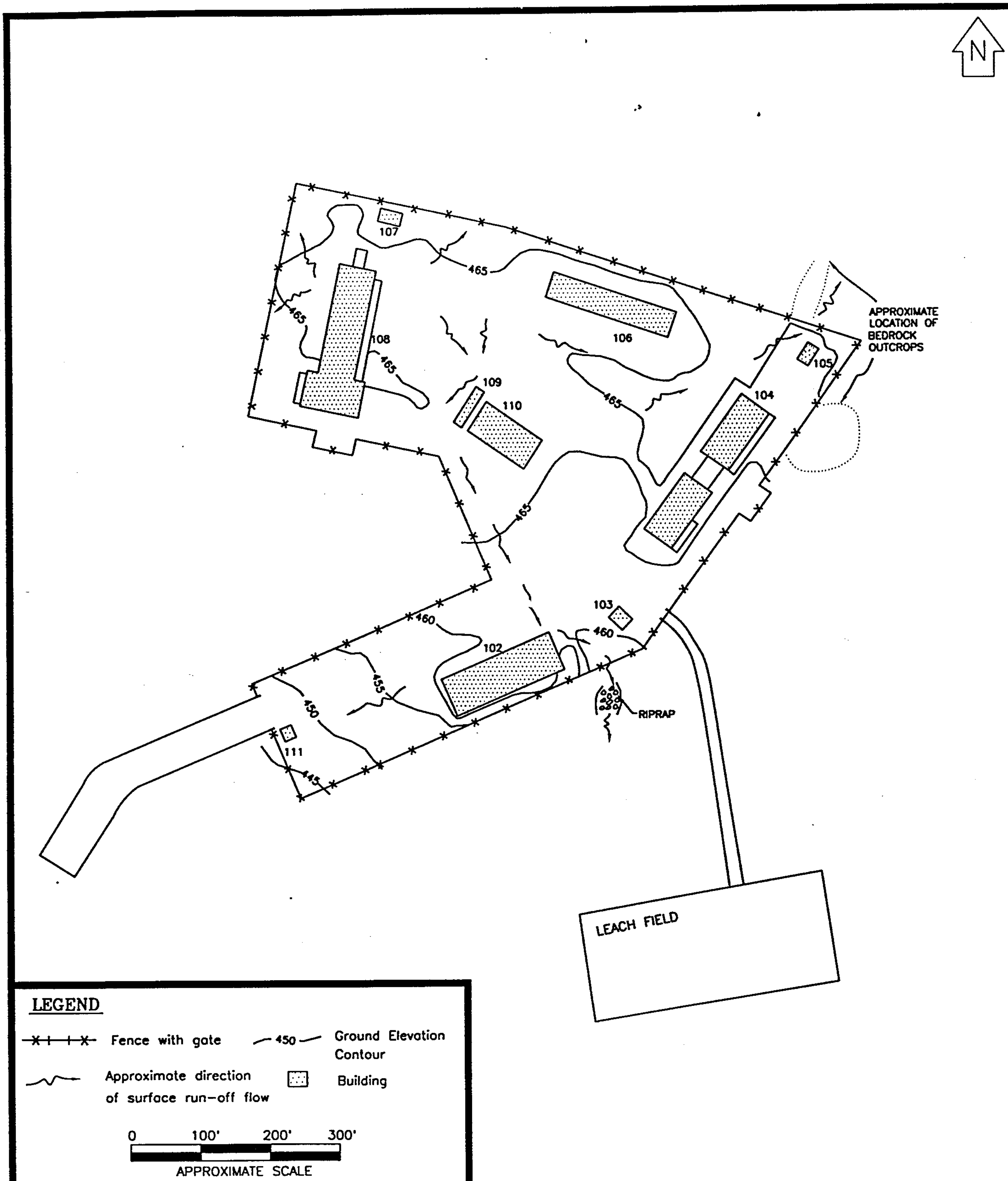


FIGURE 3-7

NORTH SMITHFIELD ANGS

STORMWATER DRAINAGE

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

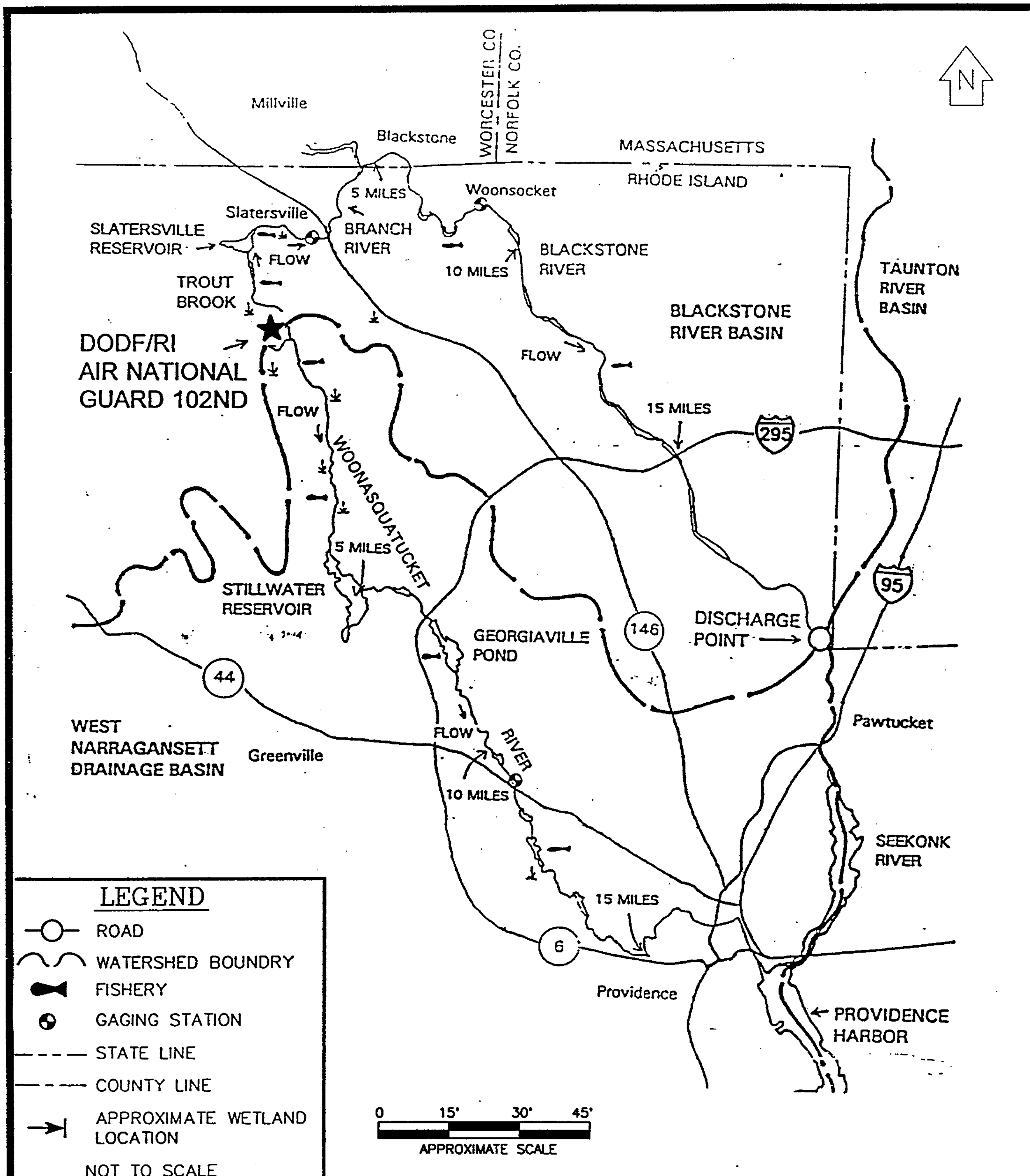


FIGURE 3-8

NORTH SMITHFIELD ANGS
LOCATION OF WETLANDS AND
OTHER SENSITIVE ENVIRONMENTS

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

northeasterly direction, through the reservoir approximately 2 miles to a point where the discharge forms the Branch River.

The Branch River flows in an easterly direction approximately 1.5 miles before turning to a northeasterly direction and traveling 1.25 miles at which point it discharges into the Blackstone River. The Blackstone River flows in a northeasterly direction approximately 1.3 miles at which point it changes direction to the southeast. It continues to flow in a southeasterly direction and eventually drains into the tidal Providence River south of the town of Pawtucket. The surface flow reaches a distance of 15 miles downstream at a point immediately south of where the US Interstate 295 bridge crosses the Blackstone River and 0.75 miles northwest of the town of Ashton Rhode Island (ANGRC, 1995). The 1990 USGS Water Data Report for Massachusetts and Rhode Island states that the mean annual flow rate at the USGS gaging station on the Branch River in Forestdale, Rhode Island is 174 cubic feet per second (ft^3/sec).

Surface water from the south and southeastern quadrants of the site flow approximately 0.3 mile and empties into wetlands that are located in the Woonasquatucket River Basin. The surface water from these wetlands flows in a southeasterly direction approximately 0.35 mile to form Primrose Pond. The wetlands that form at the southern end of Primrose Pond constitute part of the headwater of the Woonasquatucket River. At this point the surface water flows in a southerly direction for approximately 3.5 miles to where it discharges into the Stillwater Reservoir. It then flows in an easterly direction approximately 0.4 of a mile into Stillwater Pond at which point the flow turns to a southeasterly direction for approximately 0.5 of a mile to discharge into Georgiaville Pond and into the North Providence area. The end of the 15-mile downstream pathway from the site is located in the Olneyvill section of Providence (ANGRC, 1995). According to the 1990 USGS Water Data Report for Massachusetts and Rhode Island, the mean annual flow rate on the Woonasquatucket at the USGS gaging station at Centerville, Rhode Island is 73 ft^3/sec. Surface water not flowing off the Station is caught in its stormwater system. The system drains into the leach field.

Surface water in the State of Rhode Island is assigned a classification according to the usage and therefore, the sensitivity. Table 3-1 lists the classifications. The Branch River from the Slatersville Reservoir to the convergence with the Blackstone River is designated Class B. The Blackstone River is designated Class C. The Woonasquatucket River is designated Class B from the headwaters to the Providence City boundary. From there the river is designated Class C. The RIDEM reports that no municipal surface water intakes exist downstream on either waterway.

3.7 Regional Hydrogeology

Groundwater in Rhode Island occurs in three aquifer types:

1) bedrock
2) stratified glacial drift; and
3) unsorted glacial till.

TABLE 3-1
RHODE ISLAND SURFACE WATER CLASSIFICATION

CLASS A	Drinking water supply.
CLASS B	Public water supply with appropriate treatment, agricultural uses, bathing, other primary contact recreational activities, and fish and wildlife habitat.
CLASS C	Boating, other secondary contact recreational activities, fish and wildlife habitat, industrial processes, and cooling.
CLASS D	Migration of fish, and good aesthetic value.
CLASS E	Nuisance conditions, uses limited to: • certain industrial uses; • power; and • navigation.

Source: ANGRC,1995

The bedrock aquifer is regionally extensive, though transmissivity of the bedrock is low. The depth to groundwater in the bedrock aquifer is highly variable due to the unpredictability of the fractures and joints where groundwater occurs. Domestic supplies can be obtained from the bedrock aquifer at yields of 1 to 100 gallons per minute. This is the main aquifer used by private residents. The unsorted till aquifer is not generally used (municipally or privately) due to the small and unreliable yields (generally 2 gallons per minute). The stratified drift aquifer, though not as extensive as the bedrock one, is the main groundwater supply in Rhode Island. The aquifer has a saturated thickness of 40 to 60 feet, with transmissivities of 5,000 to 8,000 $feet^2$/day. Since the stratified drift aquifers are limited in extent, the State requires special protection of areas designated as groundwater reservoirs. The North Smithfield ANG Station is located south of the Slatersville groundwater reservoir.

The three aquifer types and the surface water create a large, interconnected hydrological system. Surface water commonly recharges the till and bedrock aquifers, which recharge the stratified drift aquifers. Surface water flowing over the stratified aquifers often is induced by wills to infiltrate the aquifers.

3.8 Local Hydrogeology

Two aquifers, a bedrock aquifer and a discontinuous, perched water table aquifer, are present on Black Plain Hill (ANGRC, 1995). The perched water table aquifer lies above a nearly impermeable basal till. Due to its closeness to the ground surface and thinness, the perched water table aquifer supplies few wells with groundwater. The bedrock aquifer, which carries most of the groundwater in this section of Georgiaville Quadrangle (USGS, 1975), varies widely in well yield from 1 to 23 gallons per minute for wells in Blackstone Series rocks and 1 to 30 gallons per minute for wells in the Woonasquatucket Formation. About 40 to 45 percent of all bedrock wells are in the 1 to 5 gallon per minute range (ANGRC, 1995).

Resulting from significant lateral variation in geology, groundwater flow is usually complex in glaciated areas. This is especially true on Black Plain Hill, and vicinity, where the thickness of glacial till varies from zero (outcrop areas on south facing slopes) to a few tens of feet (till covered area of north slope) and where the underlying bedrock is complexly jointed and fractured. Consequently, the well depths on Black Plain Hill and surrounding area correlate poorly with topography. Generally, well depths would be expected to increase toward recharge (high areas) and decrease toward discharge areas (low areas). Table 3-2 presents approximate populations within a 4-mile radius of the Station which obtain drinking water from private residential wells. Figures 3-9 presents the locations of public drinking water wells within a 4-mile radius of the Station.

The heterogeneity of the bedrock aquifer has a direct bearing on interpreting the source and movement of contaminants in the groundwater. Transport of contaminants, particularly those that are denser than water (i.e., dense non-aqueous phase liquids) which include chlorinated hydrocarbons, are likely to be controlled by position of jointing and

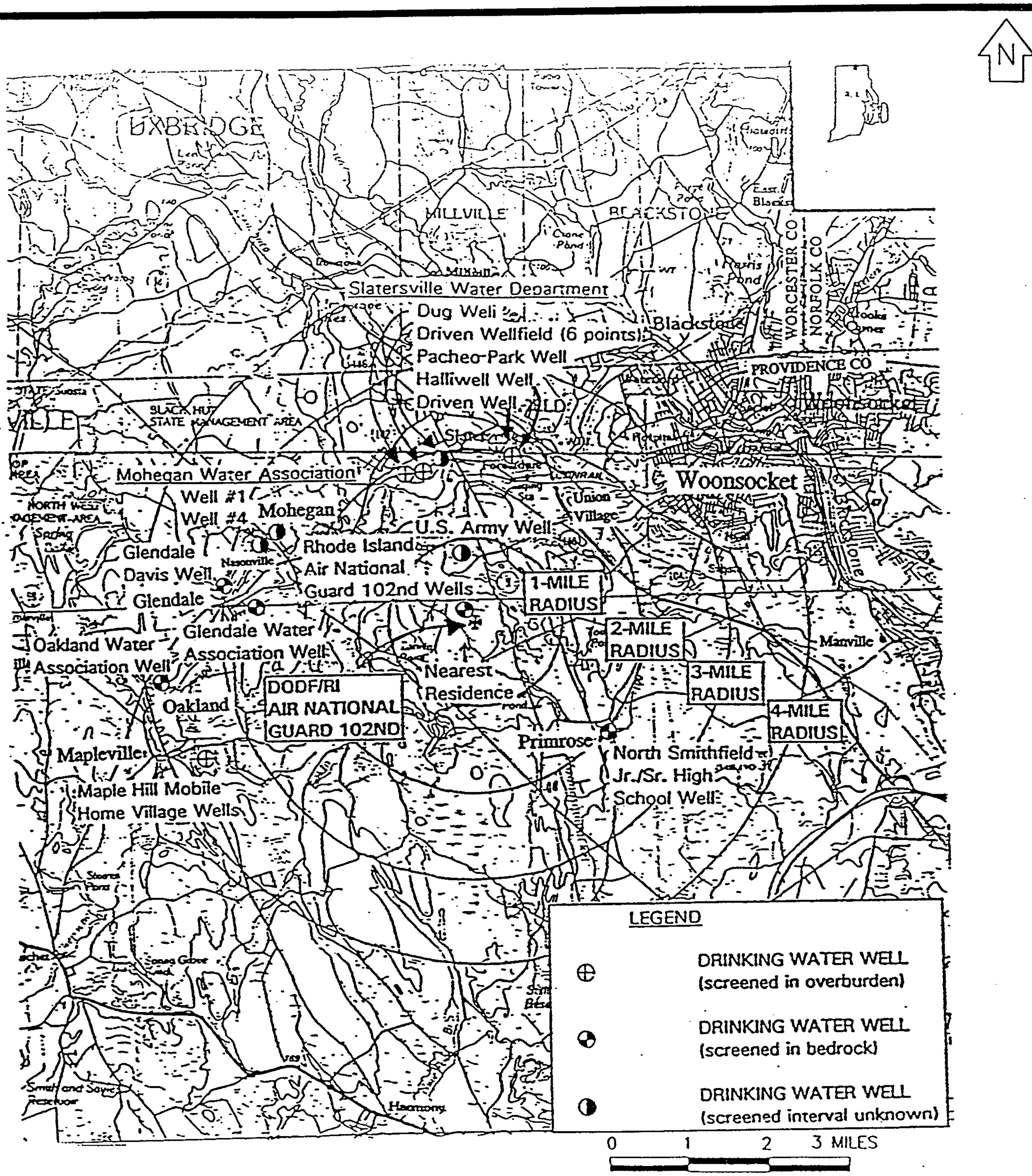
TABLE 3-2

SUMMARY OF POPULATION USING PRIVATE WELLS
WITHIN FOUR MILES OF NORTH SMITHFIELD ANG STATION

Distance Ring[1]	Approximate Population Served by Private Wells
On-site	0
0.00 - 0.25	110
0.25 - 0.50	332
0.50 - 1.0	1,327
1.0 - 2.0	4,524
2.0 - 3.0	5,924
3.0 - 4.0	5,585
TOTAL:	17,802

Note:
1. Distance rings represent a radius from the Station, in miles.

Source: ANGRC, 1995



BASE MAP IS A PORTION OF THE FOLLOWING U.S.G.S. 30 X 60 MINUTE SERIES MAPS: BOSTON, MASSACHUSETTS, 1985; PROVIDENCE, RHODE ISLAND, 1979.

FIGURE 3-9

NORTH SMITHFIELD ANGS

LOCATION OF PUBLIC DRINKING WATER WELLS WITHIN FOUR MILES

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

fracturing, rather than groundwater flow predicted from the theoretical position of the piezometric surface.

3.9 Critical Habitats, Endangered or Threatened Species

As part of the SI, Aneptek contacted RIDEM/Natural Heritage Program regarding rare species and significant natural communities within the area surrounding the site. Aneptek received a letter (RIDEM, 1995b) indicating that there were 4 locations within a 4-mile radius of the site whose status warranted classification within the framework of concern. The location, classification, and distance from the Station of each sensitive environment are shown in Table 3-3. Also located within an area that extends 15 miles downstream from the site are several fisheries and wetland areas. The location of these wetlands and fisheries are shown in Figure 3-8.

TABLE 3-3

SENSITIVE ENVIRONMENTS WITHIN FOUR MILES
OF NORTH SMITHFIELD ANG STATION

HRS Distance Radial Miles	Sensitive	Description Environments	Distance
0 - 0.25	-	-	-
0.25 - 0.50	-	-	-
0.50 - 1.0	Blunders	1 state threatened species 5 species of state interest 1 species of concern	0.6 miles
1.0 - 2.0	Woonsocket Hill Slatersville	1 endangered species 1 species of interest Reservoir	1.2 miles 1.4 miles
2.0 - 3.0	Screech Hole	1 state endangered species 1 species of concern	2.8 miles
3.0 - 4.0	-	-	-

SECTION 4.0

4.0 SITE EVALUATION

4.1 Field Program

As previously stated, this SI had two main objectives, one being the determination of the presence or absence of a source within the Station boundaries which may be contributing to contamination detected in the Station's drinking water supply wells, the other being the investigation as to the potential presence of contamination at the identified AOCs at the Station. In order to achieve these objectives, it was determined that screening level data was required over the entire Station. This screening level data was used to guide the remainder of the investigation.

The screening technique used was a soil gas survey. The results of this survey were used to guide the selection of locations for soil borings and groundwater monitoring wells. During the advancement of soil borings, subsurface soil samples were collected and screened using an on-site portable Gas Chromatograph (GC). Based on the results of the GC screening, two samples collected from each boring were submitted to the off-site laboratory for chemical analysis. Four groundwater monitoring wells were installed, and groundwater samples were collected for chemical analysis. Surface soil samples were also collected and analyzed.

A summary listing of the field work that was conducted in the three AOCs is included in Table 4-1. Figure 4-1 presents the soil gas survey grid. Figure 4-2 through 4-5 illustrate the sample locations at AOCs A through C, respectively. Figure 4-6 illustrates samples locations at other areas over the Station as well as background sample locations.

4.2 Deviations From the Work Plan

Deviations from the approved Work Plan (Aneptek, 1994a) occurred during all phases of the field investigation. These deviations occurred primarily due to site conditions that were not anticipated. A complete list and brief description of the reasons for all deviations which occurred during each phase of the field program are presented below.

Passive Soil Gas Survey

- The row of soil gas sampler tubes south of the entrance to the Station (samplers 39, 73, 74, 75, 76, 77, and 80) was moved outside the fence in order to avoid underground utilities.

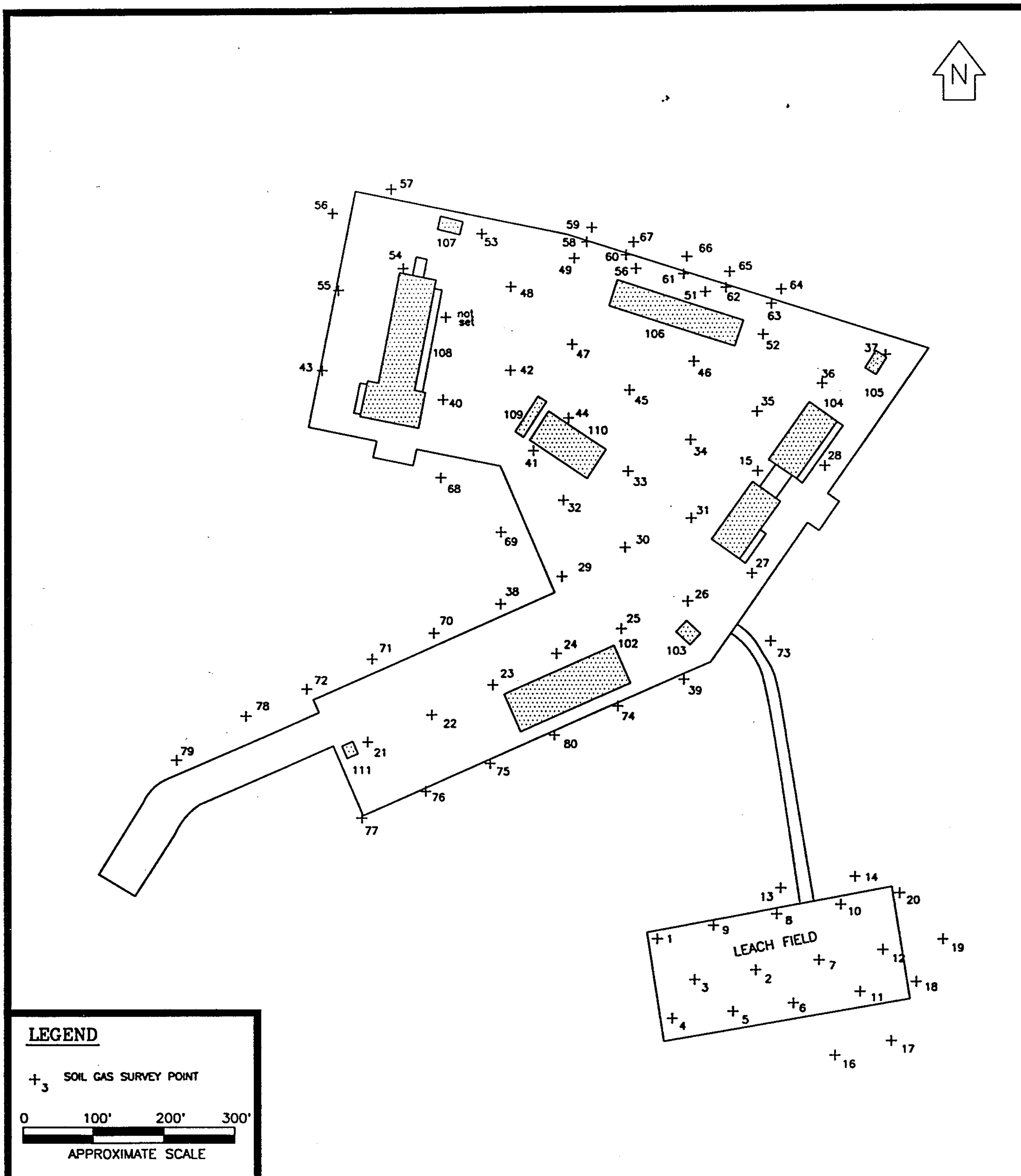
- Sampler 79 was installed approximately 20 feet south of its originally proposed location. This relocation allowed the installation of a soil gas sampler tube adjacent to one of the Station's water supply wells. The original location would have been located in a wooded area.

TABLE 4-1

SUMMARY OF FIELD ACTIVITIES

	AOC A (Area North of Building P-13)	AOC B (Fenceline Behind the Motor Vehicle Maintenance Facility)	AOC C (Former Paint/Solvent Storage Building)	OTHER AREAS	MONITORING WELLS
BORINGS					
Number of Borings	2	2	2	8	None
Maximum Depth (ft.)	12.0	10.0	12.5	16.7	-
MONITORING WELLS					
Number of Monitoring Wells	None	None	None	None	4
Depth (ft.)	-	-	-	-	8.5 - 13.0
SURFACE SOIL SAMPLING	-	2	-	1	-
WATER SAMPLING	-	-	-	-	4

- = Not Applicable



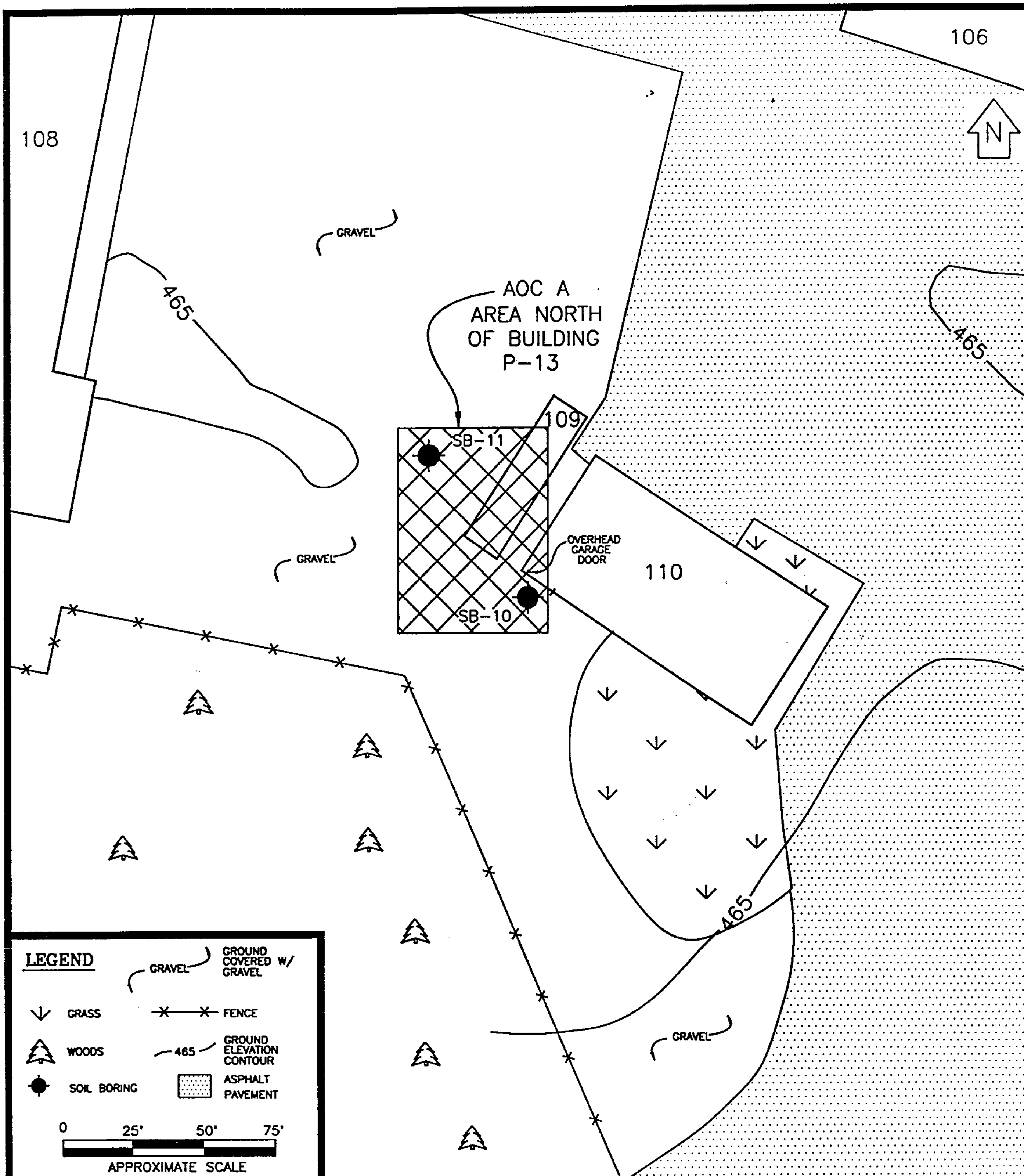
NORTH SMITHFIELD ANGS

PASSIVE SOIL GAS SURVEY GRID

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

FIGURE 4-1



NORTH SMITHFIELD ANGS
AOC A - SOIL BORINGS
AREA NORTH OF BUILDING P-13

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

FIGURE 4-2

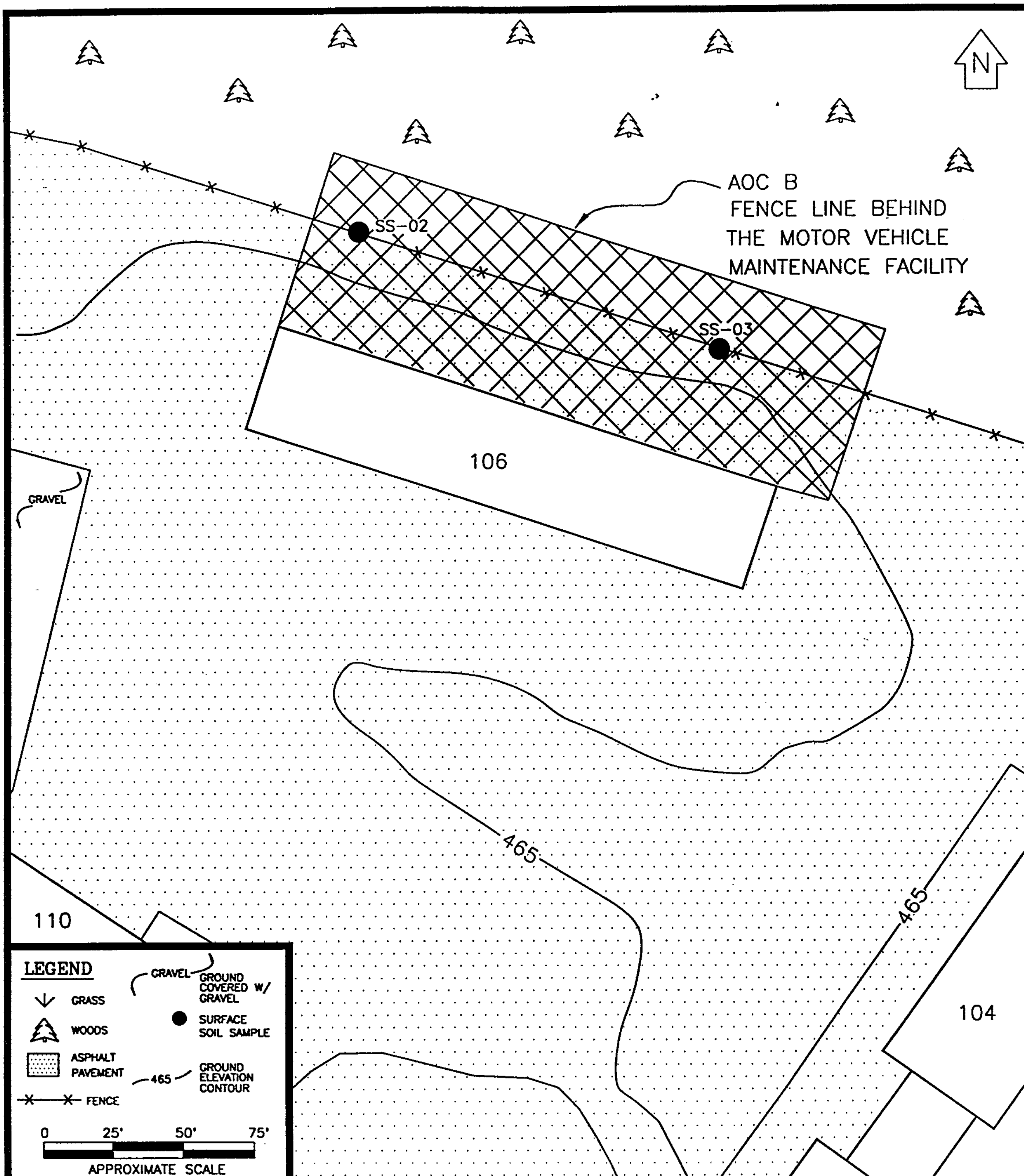


FIGURE 4-3

NORTH SMITHFIELD ANGS

AOC B
SURFACE SOIL SAMPLES

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

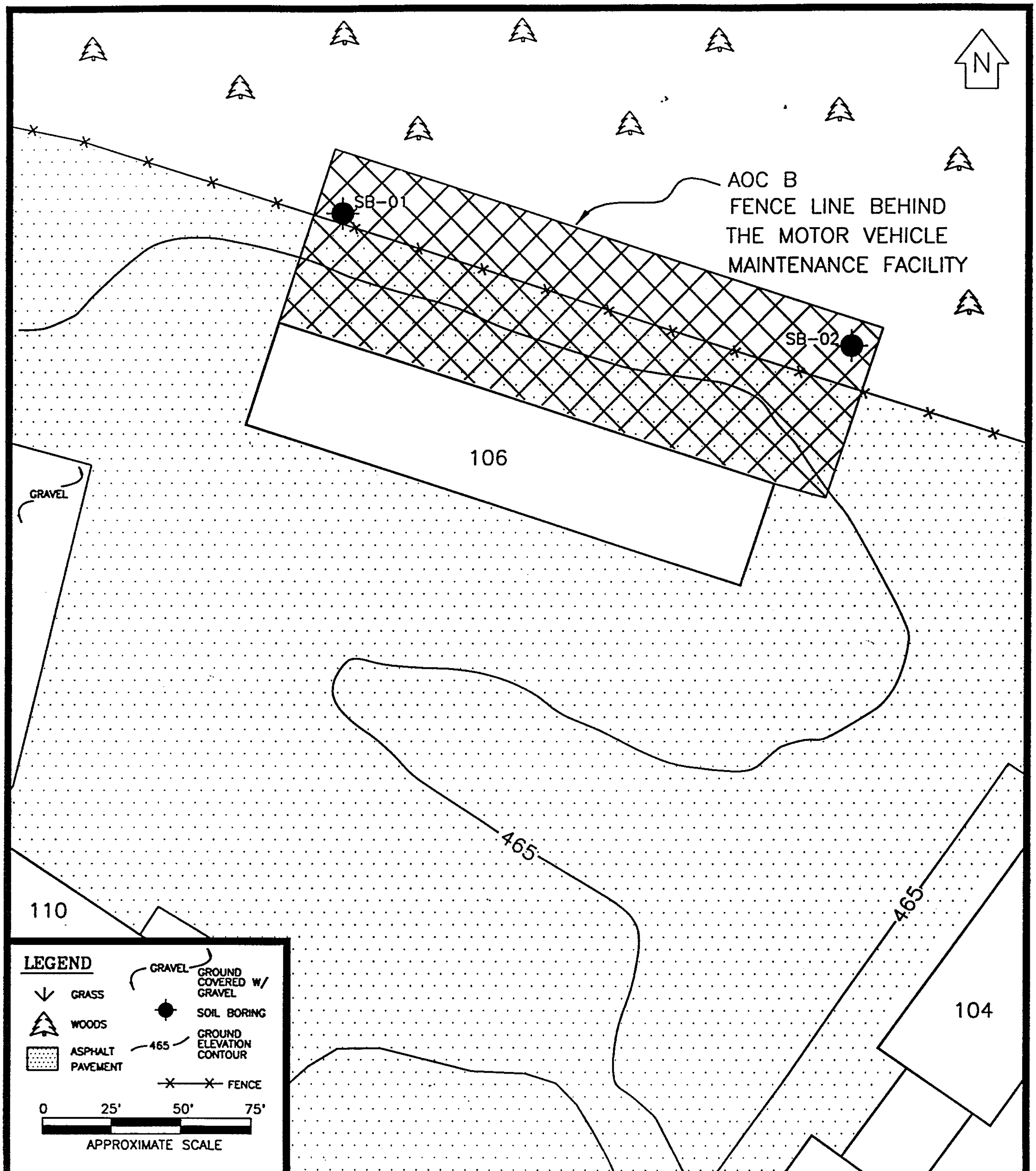
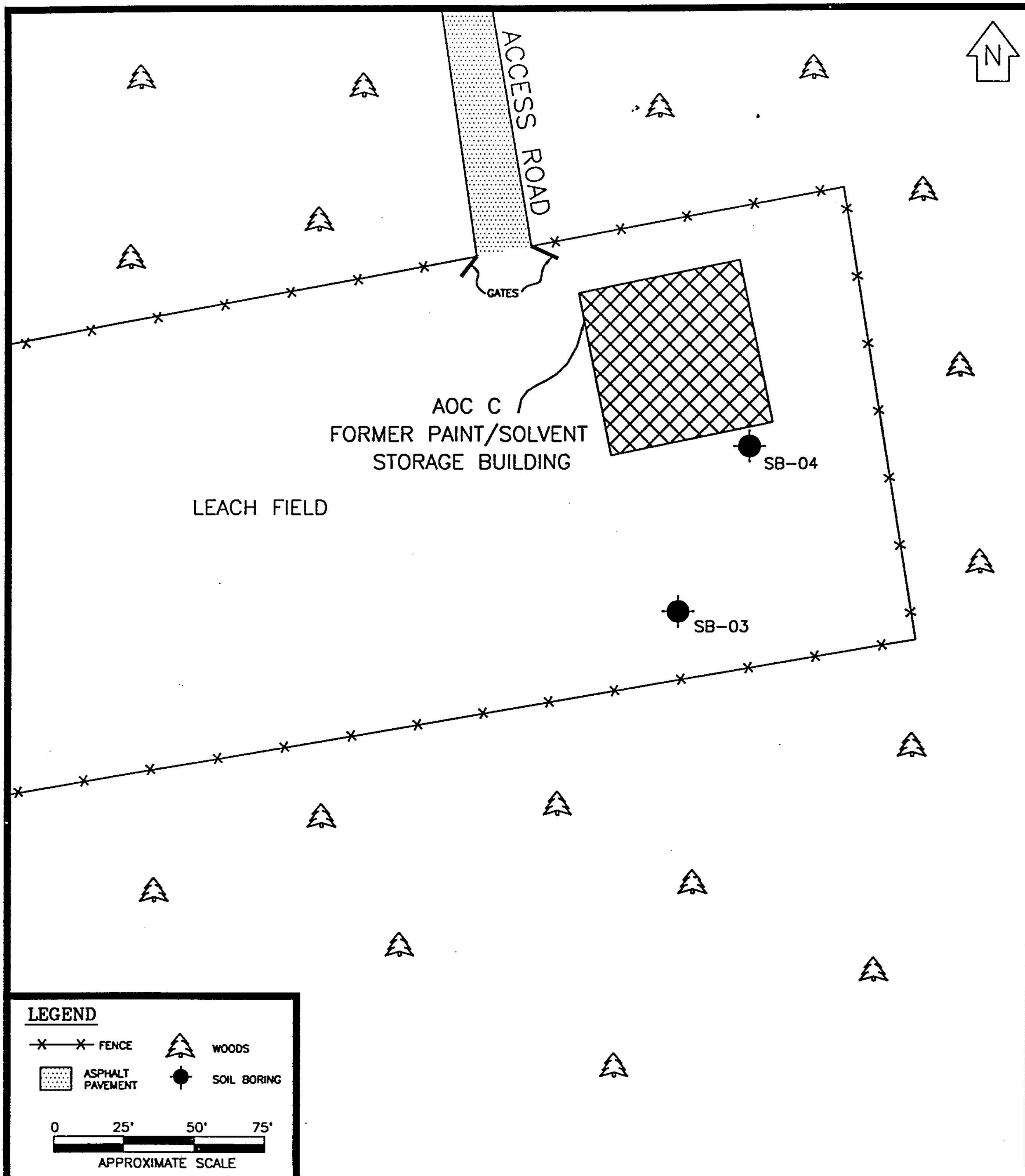


FIGURE 4-4

NORTH SMITHFIELD ANGS
AOC B – SOIL BORINGS
FENCELINE BEHIND THE MOTOR
VEHICLE MAINTENANCE FACILITY
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK
CORPORATION
Analytic, Environmental
and Process Technologies



NORTH SMITHFIELD ANGS
AOC C – SOIL BORINGS
FORMER PAINT/SOLVENT
STORAGE BUILDING

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

FIGURE 4-5

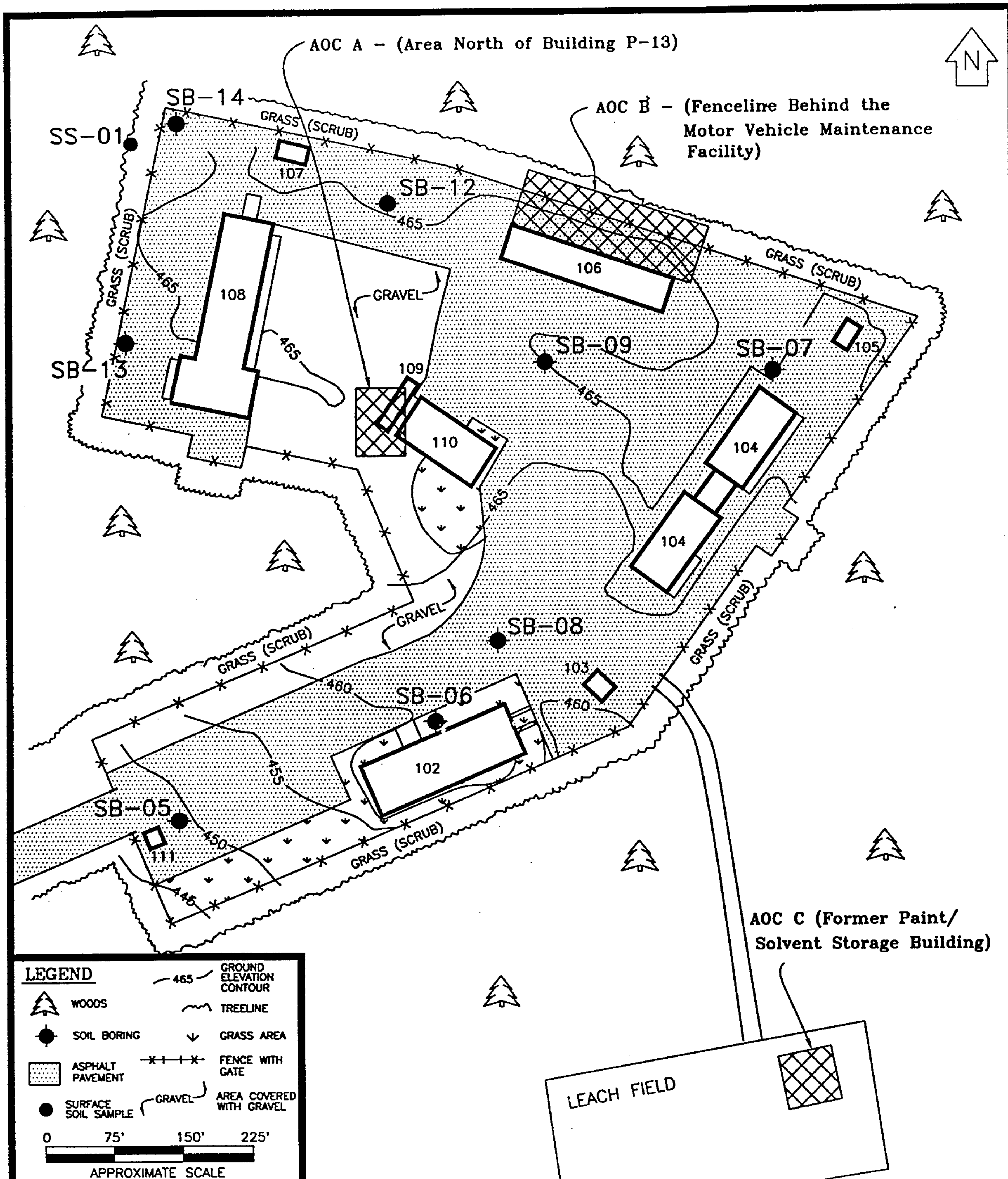


FIGURE 4-6

NORTH SMITHFIELD ANGS

OTHER AREAS AND BACKGROUND SAMPLE LOCATIONS

102ND AIR CONTROL SQUADRON

SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

- Sampler 36 was installed 20 feet south west of its originally proposed location. This adjustment was necessary as the proposed location fell under two large trailers. The sampler point was set by keeping online with the grid and setting the point 80 feet from sampler 35 instead of 100 feet.

- One sampler point which would have been located west of sampler 48 could not be set as the soils continuously collapsed in the hole. Therefore, the hole could not be kept open to allow the installation of the sampler tube.

- During installation of samplers over the leachfield, cobbles were encountered at several locations, making it necessary to attempt advancing the hole for the sampler tube in several locations prior to finding a location at which the hole could be advanced. However, these location adjustments typically resulted in the sampler being set within 5 to 10 feet of the pre-surveyed location.

Soil Boring Program

- The decontamination procedure was modified from the Final Work Plan (Aneptek, 1994a) in that the air drying step which followed a hexane rinse and preceded the deionized water rinse was omitted. The decontamination procedure followed included all other steps identified in the Final Work Plan (Aneptek, 1994a).

- The two soil borings advanced near the leachfield (AOC C), were advanced within the fenced area as opposed to outside the fenced area as indicated in Figure D-4 of the Final Work Plan (Aneptek, 1994a). This modification was required due to the inability to access the proposed locations with the drill rig. The locations at which these borings were advanced were as close to the perimeter of the leachfield as access and safety (due to the side slope of the leachfield) would allow.

- Due to insufficient recovery, no sample was collected from the 0-to 2-foot depth interval at SB-03.

- Soil boring SB-09 was advanced approximately 70 feet north of its originally proposed location due to the potential presence of underground utilities and/or sewer lines in the vicinity of the proposed location.

- Soil boring SB-11 was advanced approximately 30 feet south of its originally proposed location due to the potential presence of underground high voltage power lines in the vicinity of the proposed location.

- Soil boring SB-12 was advanced approximately 30 feet southwest of its originally proposed location due to the presence of underground power lines in the vicinity of the originally proposed location.

Groundwater Monitoring Well Installation

- No monitoring well was installed in the vicinity of the leachfield due to the absence of groundwater in the borehole at SB-03 (and SB-04). During advancement of boring SB-03 (the proposed location for the monitoring well), refusal was met on the split spoon sampler and the auger at 12.5 feet bgs and no water was encountered. The auger flights were raised approximately 6 inches and allowed to stand covered overnight. The next morning, the hole was inspected and no water was present in the hole. Therefore, no well was constructed at this location.

- All monitoring wells were installed with 5-foot well screens instead of 10-foot well screens, as proposed in the Final Work Plan (Aneptek, 1994a). This change was necessitated by the shallow depth to bedrock encountered.

- Due to the shallow depth to groundwater encountered at the location of monitoring well MW-02, the construction of the well was altered from that proposed in the Final Work Plan (Aneptek, 1994a) to ensure the well screen was situated across the groundwater table. The flush-mount road box was installed from ground surface to approximately 1 foot bgs. Immediately below the roadbox, a 1-foot layer of bentonite was installed (reduced from 2 feet). Below this layer is a layer approximately 0.5 feet thick of fine sand (reduced from 1 feet). Immediately below this layer is the well screen, surrounded by the sand filter pack of coarse sand.

- During the advancement of soil borings to be used to install wells MW-03 and MW-04, groundwater was encountered at depths of 3 feet bgs, and 3.5 feet bgs, respectively. Therefore, the construction of these wells was altered from that described in the Final Work Plan (Aneptek, 1994a). These wells were constructed such that the protective metal casing was cemented only 1-foot into the ground. Below the metal casing, is a 1-foot bentonite seal, then a 0.5-foot layer of fine sand. Immediately below this layer of fine sand is the well screen, surrounded by a coarse sand pack.

4.3 Field Screening Activities

4.3.1 Passive Soil Gas Survey

The passive soil gas survey provided initial screening level data as to the presence of possible sources of contamination, particularly TCE and TCA. A passive soil gas survey was selected rather than an active soil gas survey for several reasons. First, an active survey would have been limited in the effective area being sampled to the expected low conductivity of the subsurface soils, which would have limited the capture zone of the vapor withdrawal pump. Second, the passive soil gas survey technology selected is also capable of identifying lower concentrations of contaminants.

The passive soil gas survey was performed over the entire Station following a grid pattern, with a spacing of 100 feet (Figure 4-1). Each alternating grid row was off-set by 50 feet to enhance coverage of the Station. Over the leachfield area, the spacing of the grid was reduced such that the distance between each row of samplers was 87.3 feet and the distance between samplers within each row was 68.1 feet. These distances were determined by surveying the length and width of the top of the leachfield, and then dividing these measured distances so as to fit the number of samplers over the leachfield as proposed in the work plan. A total of 80 soil gas tubes were installed during this survey.

Soil gas sampler tubes were installed at the Station on October 13, 14, and 17, 1994. Holes for samplers installed in areas where asphalt pavement was not present were dug with a specially designed core-type shovel. Those sampler tubes installed through asphalt pavement were installed using a rotary hand drill. All holes were approximately 18 inches deep and 1.5 inches in diameter. Sampler tubes remained sealed until just prior to their placement in the ground. After placing the sampler tubes, open-end-down into the hole, the hole was plugged with aluminum foil and covered to prevent damage to the samplers. In areas of asphalt pavement the holes were covered with Quickrete™; all other the holes were covered with rocks.

Sampler tubes were retrieved on November 2 and 3, 1994. Sampler retrieval was accomplished by first removing the rock or Quickrete™, pulling the tube out by the wire attached to the tube, and then capping the tube. All tubes were then packed and shipped overnight to the laboratory for analysis. Each sampler was analyzed using thermal desorption/mass spectrometry.

4.3.2 Soil Sample Screening

Subsurface soil samples were collected during the advancement of soil borings using a 2-inch outside diameter (O.D.), 2-foot long split spoon sampler fitted with four 6-inch long brass liners. Upon retrieval of each sampler, the spoons were separated, the bottom liner was removed, capped, labeled, and placed in a cooler with ice. Next, a sample of the recovered material was collected for screening using the on-site GC. This sample was collected by inserting a disposable plastic syringe, with the bottom removed, into the recovered material, with the plunger withdrawn. Approximately 2 milliliters (ml) of the recovered soils were collected using this technique. For instances when the soil boring location was remote relative to the closest possible set-up location for the GC, 4 ml of soil were collected using this technique, and the bottom 2 ml (exposed to the air during transport), were discarded when the sample reached the GC.

The 2 ml of soil were immediately transferred to a pre-weighed 40-ml glass vial containing 30 mls of distilled water. The vial containing the soil and the water was then weighed to determine the weight of the soil sample. The vial was then agitated for 1 minute and placed in a hot water bath at 40°C to reach equilibrium for 5 minutes. A 200 microliter (μl) aliquot of the sample headspace was then injected into the GC for analysis. The GC used on-site was an SRI Model 8610 GC with a 15-meter capillary column and Photoionization Detector

(PID). An SRI Peak II computer-based software system was used to acquire the data.

Headspace analysis was performed on each sample by direct injection without sample storage or pre-concentration. Identification and quantification of analytes was achieved by comparison of retention times and relative peaks on a chromatogram with those produced by known standards formulated with reagent-grade compounds. Calibration standards were checked after each set of 8 to 10 samples were analyzed, and after each time the mobile laboratory was relocated at the Station. Method blanks and standards were analyzed daily to maintain quality control.

In accordance with ANGSIP, monitoring wells were not installed through areas of contaminated soils, thus preventing the introduction of a conduit for the transport of contamination to the groundwater table. To ensure soils were not contaminated at each proposed monitoring well location, samples of the subsurface soil were collected at every 5-foot depth interval, using a 2-inch O.D., 2-foot long split spoon sampler. The recovered material within each split spoon sampler were screened longitudinally with an HNu PID with an 11.7 electron-volt (eV) lamp. In addition to the PID screening results, visual and olfactory observations were recorded for each sample collected. All of these readings and observations were used to determine whether a given sample interval was suspected to be contaminated.

4.4 Confirmation Activities

4.4.1 Soil Borings

A total of 14 soil borings were advanced to the groundwater table or to refusal using a truck-mounted hollow stem auger drill rig. The first soil boring advanced at each AOC was sampled continuously, with all other soil borings sampled at 5-foot intervals. A portion of each soil sample was subjected to headspace screening as described in Section 4.3.2. The two potentially most contaminated soil samples (based on GC headspace screening and/or visual and olfactory observations) collected from each soil boring were submitted to the off-site laboratory for confirmatory chemical analysis.

4.4.2 Surface Soil Sampling

Three surface soil samples were collected at the Station, two at AOC B, and one at a background location. The sample locations were based both on the results of the passive soil gas survey and visual observations of drainage patterns. Surface soil sample locations at AOC B were biased to intercept any obvious areas which receive runoff from the area of the Vehicle Maintenance Facility. The background sample location was selected to provide a representative sample of background surface soil conditions. All three surface soil samples were collected using stainless steel spoons and bowls, in accordance with the approved Work Plan. All three surface soil samples were submitted to the off-site laboratory for chemical analysis.

4.4.3 Monitoring Well Installation

Four groundwater monitoring wells were installed at the Station to determine the direction of groundwater flow at the Station and to collect groundwater samples for chemical analysis. Figure 4-7 presents the location of each monitoring well.

The monitoring wells were installed using a truck-mounted, hollow-stem auger drill rig. During advancement of the borehole, samples were collected at every five-foot depth interval. These samples were logged and screened with a PID to ensure that wells were not installed through a potentially contaminated interval, resulting in the introduction of a conduit for contamination migration to the groundwater.

Monitoring wells were constructed of 2-inch diameter polyvinyl chloride (PVC) piping. Each well has a 5-foot screen across the groundwater table. The well screen and riser pipe connections were threaded. Wells MW-01 and MW-02 were installed as flush-mounted wells, with 6-inch protective road boxes. Wells MW-03 and MW-04 were finished with 4-inch diameter, 4-foot long steel protective casing cemented approximately 1 foot into the ground. This protective casing could not be cemented any deeper into the ground due to the shallow depth to groundwater at each location (approximately 3 feet bgs).

All wells have expandable well caps. Wells finished as flush-mount wells were locked with a padlock at their well caps. Wells finished above grade were locked with a padlock at the cap of the protective casing. All locks are keyed alike and the keys were left with Station personnel.

4.4.4 Specific Media Sampling

Media sampled as part of this SI include surface soil, subsurface soil, and groundwater. Each sample submitted to the off-site laboratory was subjected to chemical analysis for VOCs, SVOCs, TPH, and the thirteen Priority Pollutant (PP13) metals. The three surface soil samples were also analyzed for PCBs. Table 4-2 presents a summary of analyses performed as part of this SI.

4.5 Investigation Derived Waste

Drill cuttings from all borings and monitoring well installations were drummed in Department of Transportation (DOT) approved 17-H 55-gallon drums. After completion of the soil boring and monitoring well installation program, all drums were moved to a central location. Drill cuttings generated from soil borings or monitoring well installations from the same area of the Station were drummed together. A total of 10 drums of soil were generated.

Water generated during decontamination of drilling and sampling equipment as well as during monitoring well development and purging were also drummed and stored in a central area at the Station. Decontamination water and development and purge water were not stored in the

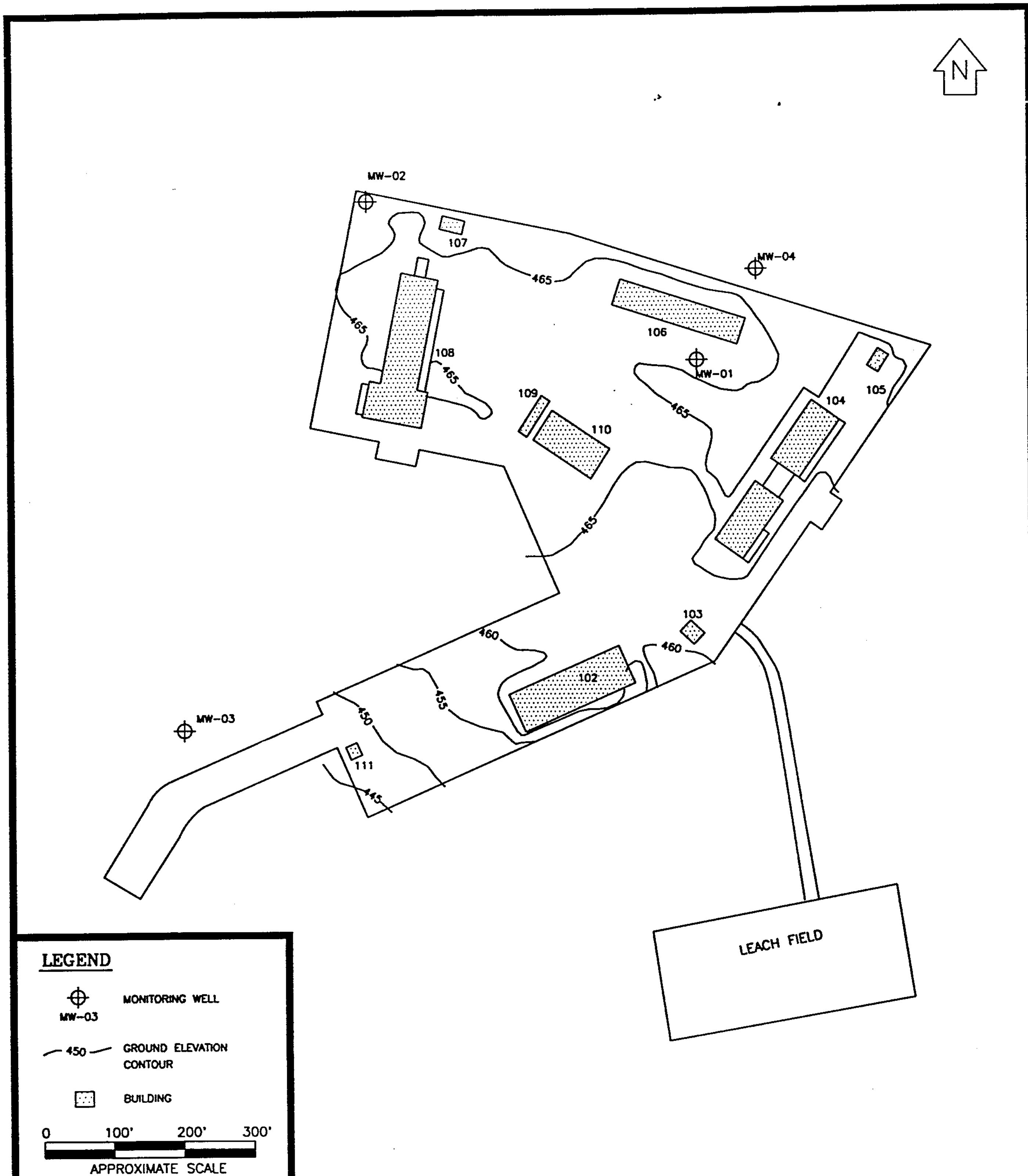


FIGURE 4-7

NORTH SMITHFIELD ANGS

MONITORING WELL LOCATIONS

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

TABLE 4-2

SUMMARY OF ANALYSES PERFORMED *

	AOC A Area North of Building P-13	AOC B Fenceline Behind Motor Vehicle Maintenance Facility	AOC C Former Paint/Solvent Storage Building	OTHER AREAS	MONITORING WELLS
	No. of Samples	No. of Samples	No. of Samples	No. of Samples	No. of Samples
VOCs EPA Method SW8240 SW8010/8020	4 soil	6 soil	-	-	4 water
SVOCs EPA Method SW8270/625	4 soil	6 soil	-	-	4 water
PCBs/Pesticides EPA Method SW8080	-	2 soil	-	1 soil	0
TPH EPA Method SW8015	4 soil	6 soil	4 soil	-	4 water
Priority Pollutant 13 Metals (PP-13)	4 soil	6 soil	4 soil	-	4 water
TCLP	1 soil	1 soil	1 soil	3 soil/1 water**	-
GC Screen	7 soil	6 soil	6 soil	21 soil	-

GC - Gas Chromatograph
PCB - Polychlorinated Biphenyls
PP13 - Priority Pollutant 13 Metals
SVOCS - Semi-Volatile Organics Compounds
TCLP -Toxicity Characteristic Leaching Procedure and Hazardous Waste Characterization
VOCS - Volatile Organic Compounds

* Soil samples taken from one boring in each AOC were collected continuously at two foot intervals and screened with a GC. The remaining borings from each AOC were sampled and screened with a GC at the surface and at 5-foot intervals.

** Water was generated and collected from monitoring well purging and development, and equipment decontamination.

same drums. At the completion of the collection of groundwater samples, all drummed water, totalling approximately 170 gallons, was treated via a Carbtrol™ activated carbon unit.

The drums of water and soil were labelled for identification and are currently stored at the Station. Composite soil samples were collected from the drummed soils. Soils generated from borings and monitoring wells from the same areas of the Station were used for each composite sample. A total of 6 samples of the drummed soils were collected and submitted to the off-site laboratory for Toxicity Characteristic Leaching Procedure (TCLP) testing to support a determination of an appropriate method of treatment or disposal of these soils. One sample of the effluent from the activated carbon treatment system was collected and submitted to the off-site laboratory for chemical analysis to support a determination of an appropriate method of treatment or disposal of the water. Only one sample was collected due to the capacity of the activated carbon system in comparison to the volume of water treated. Guidance received by the U.S. EPA on other sites undergoing similar investigations required that one sample of the effluent be analyzed for every 1000 gallons of decontamination, purge, and development water treated by the Carbtrol™ system.

Significant observations from the TCLP testing of the samples collected include:

- Barium was detected in all TCLP extract from the Investigation Derived Waste (IDW) soil samples at concentrations ranging from 0.57 mg/L to 0.96 mg/L. As noted in 40 CFR Part 261.24, the regulatory limit for barium is 100 mg/L.

- Arsenic was detected in sample IDW-03 at a concentration of 0.21 mg/L. As noted in 40 CFR Part 261.24, the regulatory limit for arsenic is 5.0 mg/L.

- No other detections of any compounds were encountered during TCLP testing of the IDW soil samples.

- One VOC, toluene, was detected in the IDW water sample at a concentration of 9 μg/L. The Federal Maximum Contaminant Level (MCL) for toluene, promulgated under the Safe Drinking Water Act (SDWA) (U.S. EPA, 1994) is 1.0 mg/L, approximately, 100 times greater than the concentrations detected in this sample.

- Two SVOCs, bis(2-ethylhexyl)phthalate and 2-methylnaphthalene, were detected, each at a concentration of 2.0 μg/L. As previously discussed, bis(2-ethylhexyl)phthalate is suspected to be a laboratory or sampling artifact. An MCL has not been set for either of these compounds.

- Inorganics detected include: arsenic, copper, silver, and zinc, at concentrations of 0.013 mg/L, 0.012 mg/L, 0.018 mg/L, and 0.032 mg/L, respectively. Of these compounds, a MCL has only been set for arsenic, at 0.05 mg/L. An Action Level of 1.3 mg/L has been set for copper. Health Advisories for a 10-kilogram child presented under the SDWA for silver and zinc are 0.2 mg/L and 3.0 mg/L, respectively.

Based on these results of the analyses performed, compared with the regulatory limits, it is recommended that all IDW soil and water be disposed of by spreading on the ground surface.

SECTION 5.0

5.0 INVESTIGATION FINDINGS

5.1 Base-Wide Geologic and Hydrologic Investigation Results

As described in Section 3.5, soils at the top of Black Plain Hill were reported to consist of an upper till which is described as a sandy, friable till; and a lower till, described as a hard, compact clayey till. Soil borings advanced during this SI appear to have penetrated only the upper, sandy till. As noted in the boring logs (Appendix C), soils encountered were mostly sandy silts, with only a trace presence of clay.

In order to determine the direction of groundwater flow at the Station, two rounds of water level measurements were taken in each well installed at the Station. All measurements of the depth to groundwater were taken from the highest point of the PVC riser pipe, which had been previously marked with black indelible ink. The elevation of the marked point on each PVC riser was surveyed relative to an arbitrary datum chosen as 100 feet. Figures 5-1 and 5-2 present inferred groundwater contours based on elevation readings taken on December 13, 1994 and January 20, 1995, along with a review of the site topography and available data on surface and subsurface conditions at the Station.

The shape of the contours presented in Figures 5-1 and 5-2 reflects the presence of an apparent bedrock ridge located below Building 104. A review of logs for soil borings advanced in September 1988 showed that refusal was met between 1.0 and 5.0 feet bgs for three borings advanced behind (southeast) of Building 104. Borings advanced immediately in front (northwest) of Building 104 were advanced to depths of between 12 and 14 feet bgs before encountering bedrock. Therefore, it was felt the groundwater contours needed to illustrate the presence of this subsurface feature. Locally, underground structures such as storm drains, electrical conduit, etc. may be effecting groundwater flow in various portions of the Station.

It is noted that between the two rounds of measurements, the elevation of groundwater in MW-01 raised over 1.0 feet, while the elevation in MW-04 remained fairly constant. This observation appears to indicate these wells may not be hydraulically connected. For this reason, it is suspected the a groundwater divide, such as illustrated in the figures, is present between these two wells. This conclusion is also supported by the general topography of the Station, in that the Station is located on a topographic high and radial flow would be expected.

5.2 Background Sampling Results

Samples of surface soil, subsurface soil, and groundwater were collected from locations considered representative of background conditions at the Station. These samples were submitted to the off-site laboratory for the same chemical analyses as other samples for each respective media. The results of these analyses were then used as a basis for comparison in determining whether concentrations of compounds detected in samples collected from potentially

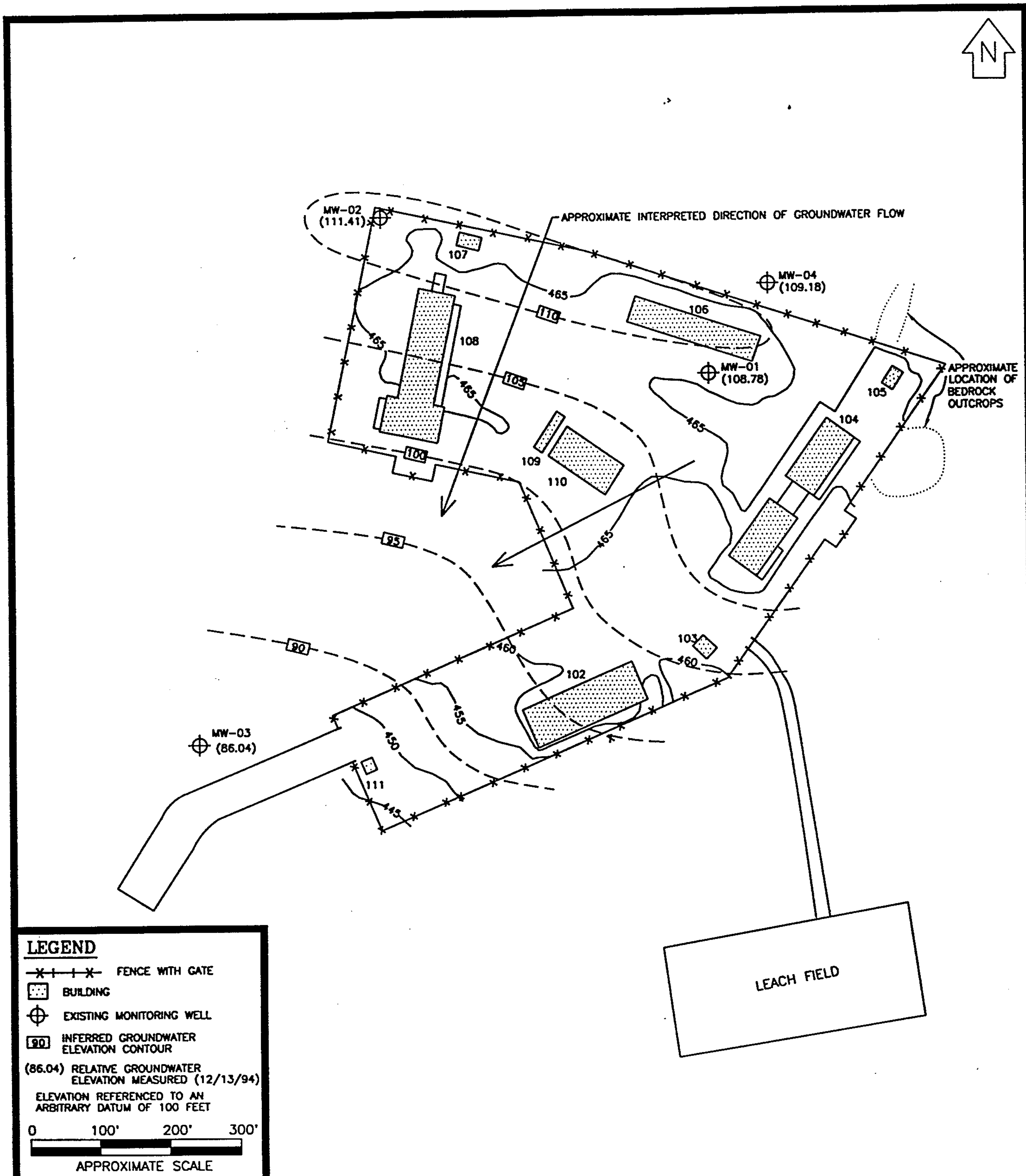


FIGURE 5-1

NORTH SMITHFIELD ANGS

DECEMBER 1994 GROUNDWATER ELEVATION CONTOUR MAP

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

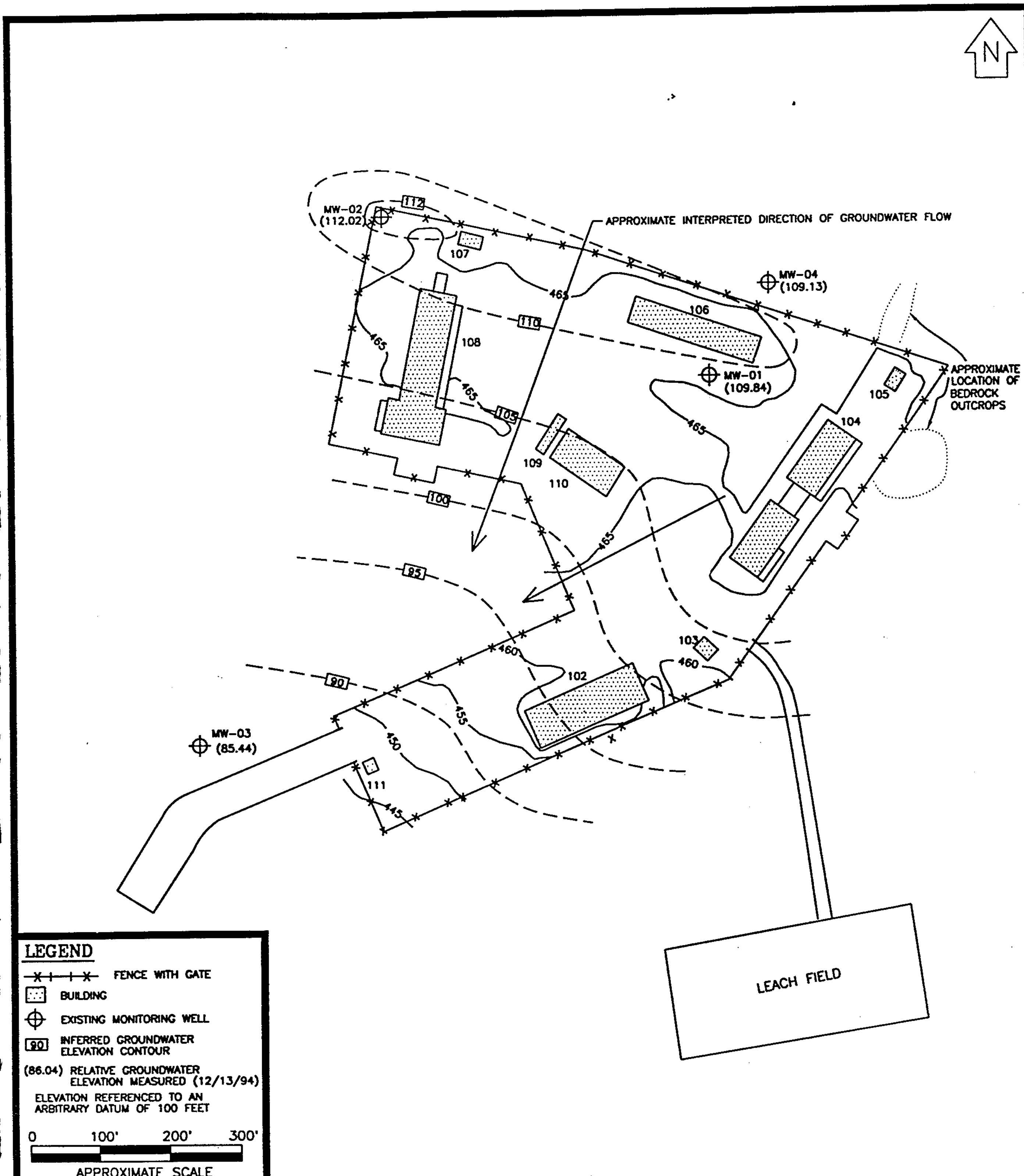


FIGURE 5-2

NORTH SMITHFIELD ANGS
JANUARY 1995 GROUNDWATER ELEVATION CONTOUR MAP
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

contaminated areas were considered elevated.

Concentrations of inorganic compounds, detected during the analysis of soil samples collected at the Station, were compared to concentrations of the same inorganic compound detected in the background samples collected. For subsurface soil samples, concentrations of detected inorganic compounds were compared to the average of the concentrations detected in the background soil samples SB-14-07 and SB-14-02.5. For surface soil samples, the concentrations detected in background sample SS-01 were used for comparison. As agreed to with RIDEM, the concentration of an inorganic compound detected in a soil sample collected from the Station was considered to be elevated if that concentration exceeded three times the background concentration for that compound. Figure 5-3 presents a summary of the analysis of the background samples for organic compounds. Tables 5-1 and 5-2 present the reference inorganic concentrations for surface soils and subsurface soils, respectively. If a particular inorganic compound was not detected in the background samples, detected concentrations were compared to the reporting limits for the compounds in the background samples.

Concentrations of compounds detected in the groundwater sample collected from the upgradient, background well MW-02, were used to determine whether a concentration of a compound detected in other groundwater samples was considered to be elevated. A concentration detected in a groundwater sample was considered to be elevated if that concentration exceeded three times the concentration of that same compound detected in the background sample. Table 5-3 presents the reference criteria for inorganic compounds detected in groundwater samples.

No organic compounds were detected in either the filtered or unfiltered groundwater sample collected from background well MW-02. The only inorganic compounds detected in the sample collected from background well MW-02 were chromium, copper, lead, and zinc. All of these inorganic compounds were detected at concentrations below their respective MCL.

5.3 Base-Wide Passive Soil Gas Survey

The results of the passive soil gas survey conducted over the Station were used to adjust proposed soil boring locations and to identify any other areas at the Station which may contain elevated levels of contaminant concentrations. The following presents a discussion of the results of the passive soil gas survey as they pertain to the overall Station and areas other than the three identified AOCs. The results of the passive soil gas survey in the immediate vicinity of each identified AOC are presented in relation to that AOC in the following subsections of this report. The full report on the passive soil gas survey, including complete analytical data and a statistical analysis of the data is presented in Appendix A.

Analysis of the 80 soil gas sampler tubes produced ion counts of various compounds which had adsorbed to the carbon in the sampler. These relative ion counts were subsequently mapped over the grid which had been surveyed over the Station. Areas in which elevated levels of compounds were detected were identified and contoured. The contour intervals used to

SB-14

Sample Designation	SB-14-02.5	SB-14-07
Sample Depth (feet bgs)	0-2.5	05-07
Parameter		
SVOCs (µg/kg)		
Chrysene	170	ND
Pyrene	170	ND
TPH (mg/kg)	ND	3

SS-01

Sample Designation	SS-01
Sample Depth (feet bgs)	0-0.5
Parameter	
VOCs (µg/kg)	
Toluene	48
SVOCs (µg/kg)	
Benzoic Acid	600
bis(2-Ethylhexyl)Phthalate	170
TPH (mg/kg)	9.1

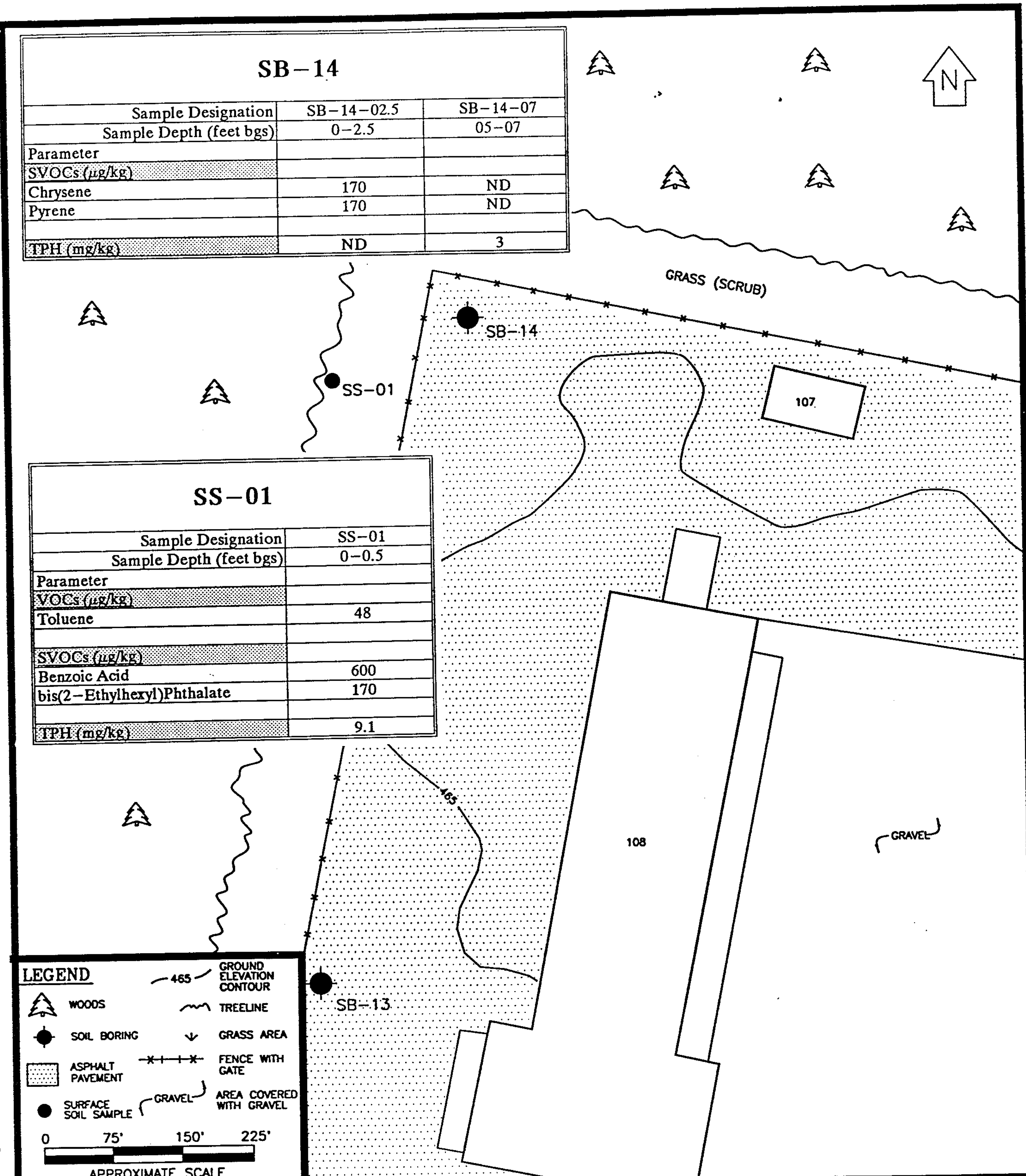


FIGURE 5-3

NORTH SMITHFIELD ANGS

ANALYTICAL RESULTS
BACKGROUND SAMPLE LOCATIONS

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

TABLE 5-1

SURFACE SOILS
REFERENCE INORGANIC CONCENTRATIONS

Analyte	Background Concentration SS-01 (mg/kg)	Reference Concentration (3 x Background Conc.) (mg/kg)
Antimony	<9.2	<9.2
Arsenic	<3.1	<3.1
Beryllium	0.98	2.94
Cadmium	<0.92	<0.92
Chromium	8.3	24.9
Copper	4.9	14.7
Lead	15	45
Mercury	<0.15	<0.15
Nickel	7.6	22.8
Selenium	<1.5	<1.5
Silver	<0.92	<0.92
Thallium	<0.31	<0.31
Zinc	22	66

TABLE 5-2

SUBSURFACE SOILS
REFERENCE INORGANIC CONCENTRATIONS

Analyte	SB-14-2.5	SB-14-07	Average Concentration (mg/kg)	Ref. Concentration (3 x Ave. Conc.) (mg/kg)
Antimony (Sb)	<6.4	<6.7	<6.55	<6.55
Arsenic (As)	<2.1	<2.2	<2.15	<2.15
Beryllium (Be)	0.73	0.73	0.73	2.19
Cadmium (Cd)	<0.64	<0.67	<6.55	<6.55
Chromium (Cr)	5.9	3.8	4.85	14.55
Copper (Cu)	14	20	17	51
Lead (Pb)	32	9.5	20.75	62.25
Mercury (Hg)	<0.11	<0.11	<0.11	<0.11
Nickel (Ni)	8.2	6.4	7.3	21.9
Selenium (Se)	<1.1	<1.1	<1.1	<1.1
Silver (Ag)	<0.64	<0.67	<6.55	<6.55
Thallium (Tl)	<2.1	<2.2	<2.15	<2.15
Zinc (Zn)	28	23	25.5	76.5

TABLE 5-3

GROUNDWATER
REFERENCE INORGANIC CONCENTRATIONS

Analyte	Background Concentration MW-02 (mg/L)	Reference Concentration (3 x Background Conc.) (mg/L)
Antimony	<0.10	<0.10
Arsenic	<0.010	<0.010
Beryllium	<0.0050	<0.0050
Cadmium	<0.0050	<0.0050
Chromium	0.017	0.051
Copper	0.024	0.072
Lead	0.013	0.039
Mercury	<0.00020	<0.00020
Nickel	<0.040	<0.040
Selenium	<0.0050	<0.0050
Silver	<0.010	<0.010
Thallium	<0.010	<0.010
Zinc	0.060	0.18

identify areas considered to contain elevated levels of compounds in the soil gas were determined using histograms formulated from the statistical distribution of the soil gas data set. Figures 5-4 and 5-5 present the areal distribution of the gasoline characteristic compounds, consisting mostly of benzene, ethylbenzene, toluene, and xylene (BTEX), and fuel-oil-related compounds (heavier hydrocarbons), respectively.

It should be noted that the contoured areas presented in Figures 5-4 and 5-5 vary slightly from those presented in Figures D-2 and D-3 which were presented in the Final Work Plan (Aneptek, 1994a). This variation is due to a more recent statistical analysis of the data which has identified a more appropriate contour interval than originally used. This statistical analysis of the data could not be performed prior to the submittal of the Final version of the Work Plan due to time constraints. Therefore, at that time, a contour interval was developed based on past experience with this type of survey and a preliminary review of the analytical data results. However, all sample locations and ion counts detected are consistent between the two sets of figures.

In addition to the areas identified in Figures 5-4 and 5-5, analysis of the soil gas sampler tubes showed detections of TCE and tetrachloroethene (PCE) at some of the locations. TCE was detected at sample locations 24 and 36 with relative ion counts of 318,638 and 24,632, respectively. Discussions with a representative of Northeast Research Institute LLC (NERI), the supplier and analyzer of the samplers, have identified these levels as being moderate to low, based on experience with this type of survey. PCE was detected at sampler locations 15, 24, 36, 37 at relative ion counts of 16,238; 26,214; 491,484; and 80,379, respectively. As noted with respect to TCE, these levels are considered moderate to low based on NERI's experience with this type of survey. No other detections of any other chlorinated compounds were encountered during analysis of the soil gas samplers.

In addition to the three identified AOCs, four areas were identified by the passive soil gas survey as potentially containing elevated levels of fuel-related compounds, as depicted in Figures 5-4 and 5-5. These areas are discussed below.

Area Adjacent to Building 111

Results of the soil gas survey identified this area as potentially being contaminated with fuel-related compounds, including BTEX and heavier hydrocarbons. Analysis of the two sampler tubes in this area of the Station (Nos. 21 and 22) identified these compounds.

Area West of Building 108

Results of the soil gas survey identified this area as potentially being contaminated with BTEX compounds. One sampler (No. 43) was found to contain these compounds.

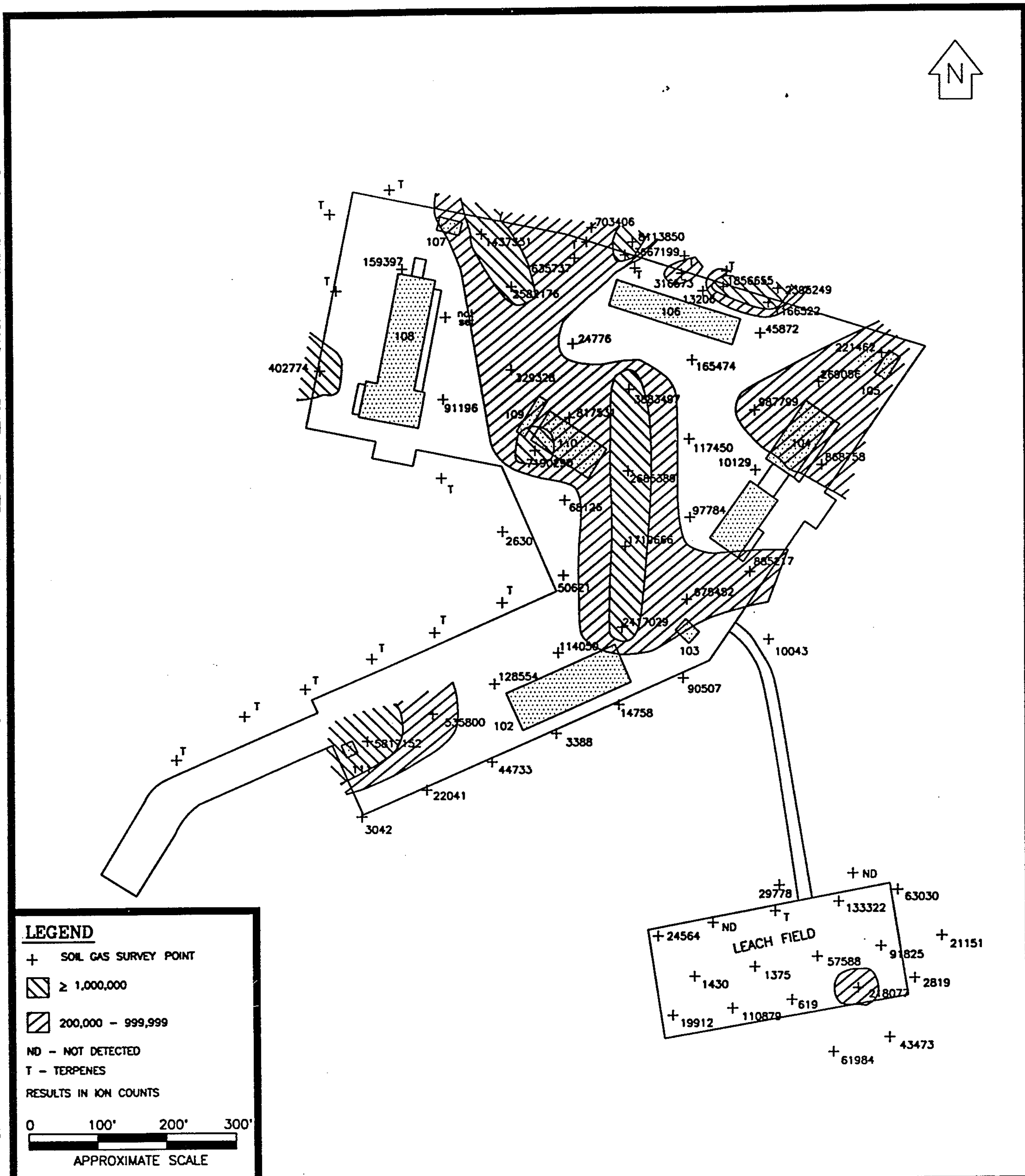


FIGURE 5-4

NORTH SMITHFIELD ANGS
GASOLINE CHARACTER MAP
(Mostly BTEX)

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

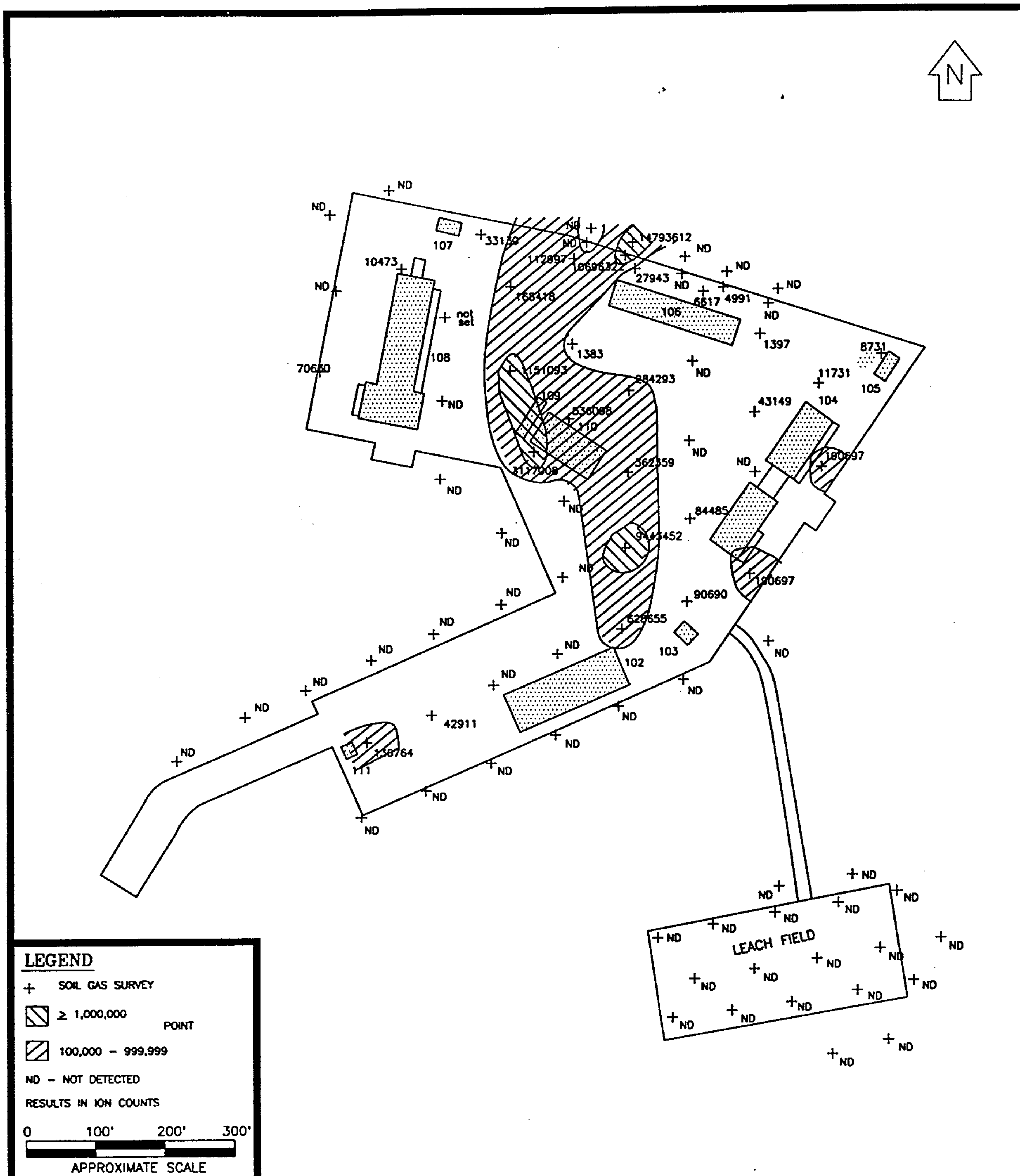


FIGURE 5-5

NORTH SMITHFIELD ANGS
FUEL OIL CHARACTER MAP
(Heavier Hydrocarbons)
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

Area Southeast of Building 107

Results of the soil gas survey identified this area as potentially being contaminated with BTEX compounds. Also, this area is located within a relatively large portion of the Station found to be potentially contaminated with heavier hydrocarbons. Two samplers (Nos. 48 and 53) were found to contain elevated levels of BTEX compounds.

Linear Area in the Central Portion of the Station

Results of the soil gas survey identified this area as the largest area of potentially elevated concentrations of both BTEX compounds and heavier hydrocarbons. This area was defined by compounds detected in four soil gas samplers (Nos. 25, 30, 33, and 45) and appears to coincide with the reported location of a sanitary sewer at the Station.

5.4 Site Findings - AOC A - Area North of Building P-13

5.4.1 Geologic Investigation Results

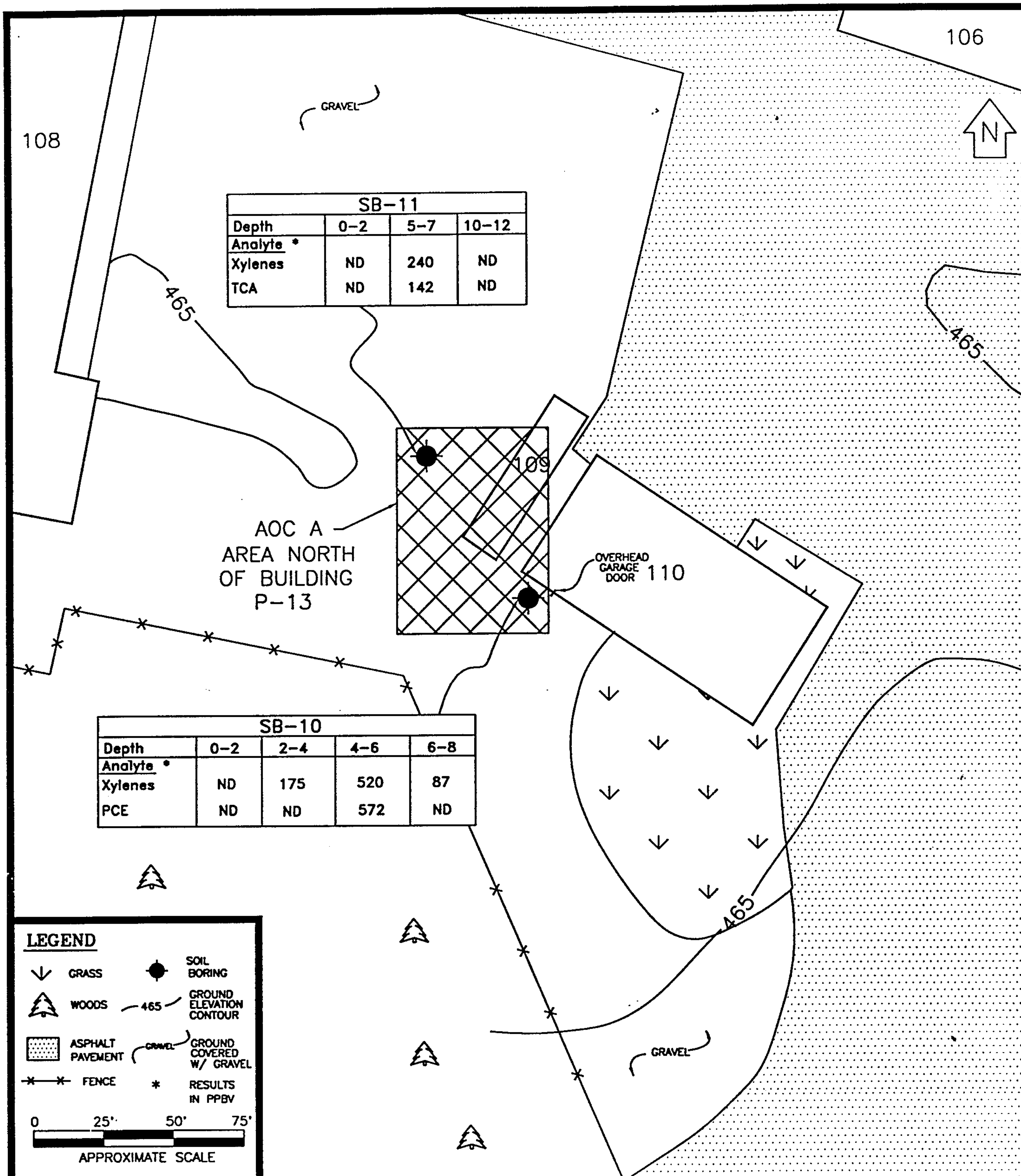
Soils in this portion of the Station appear to consist of the upper sandy, friable till reported to be present at the top of Black Plain Hill. Soil descriptions noted in the soil boring logs for borings SB-10 and SB-11, (Appendix C), show these soils contain fine sands and sandy silts, with varying amounts of gravels. Groundwater in this portion of the Station is interpreted to flow towards the south.

5.4.2 Passive Soil Gas Survey Results

The soil gas survey identified the potential presence of elevated concentrations of fuel-related compounds, as illustrated in Figures 5-4 and 5-5. Analysis of sampler tubes Nos. 41 and 42 detected the presence of both gasoline characteristic compounds and fuel-oil characteristic compounds at these locations. The area identified by the passive soil gas survey was situated such that it encompassed the area beneath the western corner of Building 110 and the majority of Building 109. Based on the statistical analysis of the data set produced from the analysis of all the sampler tubes across the Station, the levels detected in these sampler tubes are considered to be moderate to high detections.

5.4.3 GC Screening Results

Seven subsurface soil samples collected during the advancement of soil borings SB-10 and SB-11 at AOC A were screened on-site with the portable GC. Specifically, these samples were screened for BTEX, TCE, TCA, dichloroethene (DCE) and PCE. Figure 5-6 presents the locations and depths at which compounds were detected by the GC screening. Complete results of the GC screening are presented in Appendix B.



SB-11			
Depth	0-2	5-7	10-12
Analyte *			
Xylenes	ND	240	ND
TCA	ND	142	ND

SB-10				
Depth	0-2	2-4	4-6	6-8
Analyte *				
Xylenes	ND	175	520	87
PCE	ND	ND	572	ND

FIGURE 5-6

NORTH SMITHFIELD ANGS

FIELD GC SCREENING RESULTS
AOC A – SOIL BORINGS

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

Analysis of the four subsurface soil samples collected from location SB-10 found the presence of total xylenes in the lower three samples ranging in concentration from 87 to 520 parts per billion by volume (ppbv). PCE was also detected in one sample, SB-10-06 at a concentration of 572 ppbv. However, PCE was not detected in the samples collected immediately above and immediately below SB-10-06.

Analysis of subsurface soil samples collected from SB-11 detected compounds in only one of the three samples collected. Sample SB-11-07 was found to contain total xylenes and TCA at concentrations of 240 and 142 ppbv, respectively. Analysis of sample SB-11-12 did not show either of these compounds to be present at lower depth intervals.

5.4.4 Soils

Two soil borings were advanced at AOC A as described in Section 4.0. The locations of these soil borings, presented in Figure 5-6, were determined based on the results of the passive soil gas survey discussed in Section 5.2. The first boring, SB-10, was sampled continuously to the groundwater table (approximately 8 feet bgs). The second boring, SB-11 was sampled at 5-foot depth intervals to a total depth of 12 feet bgs. Four soil samples collected from SB-10, and three soil samples collected from SB-11 were subjected to on-site GC screening. Four samples of the subsurface soils, 2 from each soil boring, were submitted to the off-site laboratory for chemical analysis as described in Section 4.0. A summary of the analytical data for soil borings SB-10 and SB-11 is presented in Figure 5-7.

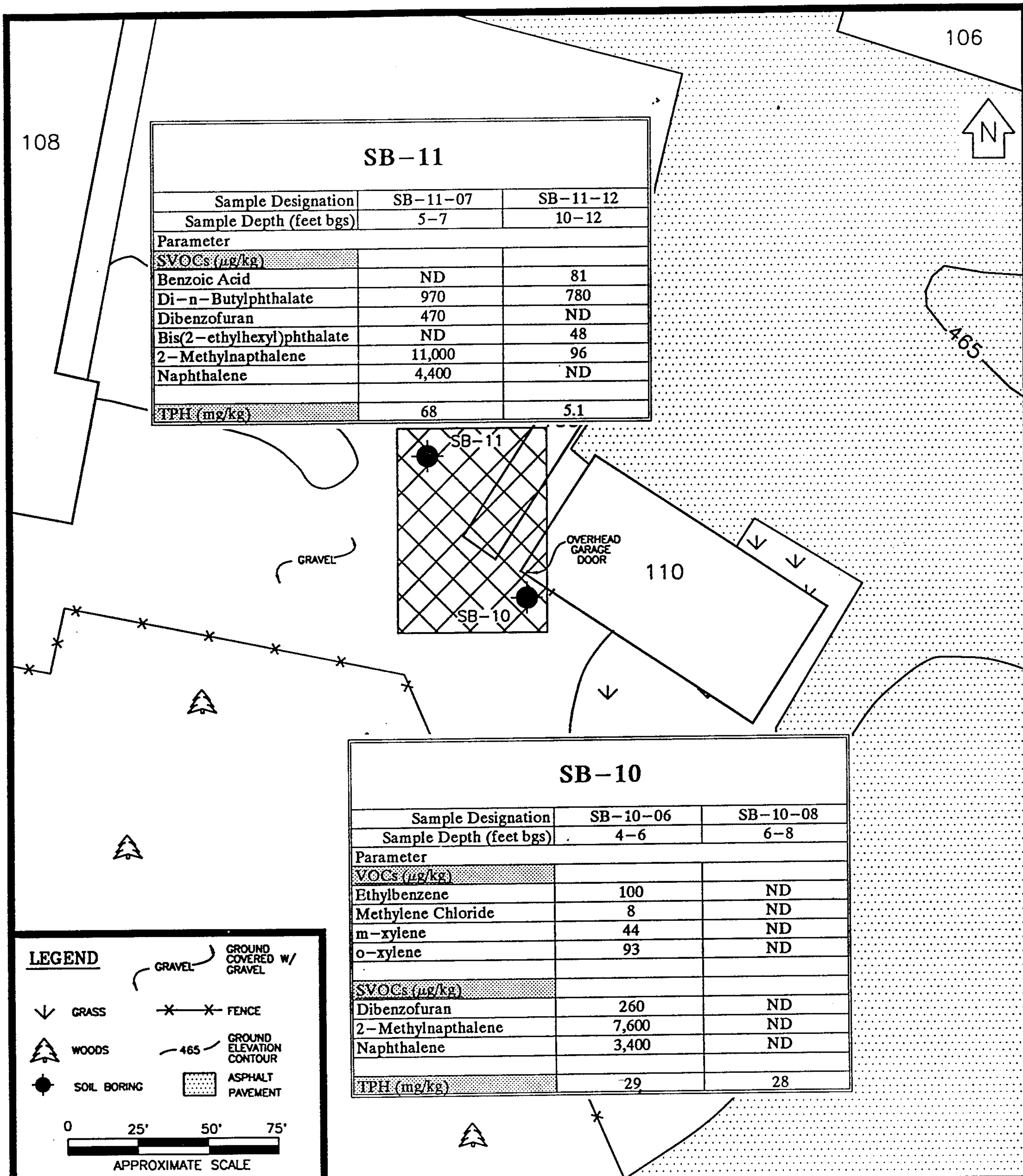
Significant observations from the analysis of the samples collected include:

- Four VOCs, including ethylbenzene, methylene chloride, m-xylene, and o-xylene, and three SVOCs including dibenzofuran, 2-methylnaphthalene, and naphthalene were detected in the sample collected from the 4-to 6-foot depth interval in boring SB-10. None of these compounds were detected in the sample collected from the 6 to 8 foot depth interval at SB-10. Methylene chloride is a common laboratory contaminant.

- Analysis of all four subsurface soil samples from AOC A detected TPH at concentrations ranging from 5.1 milligrams per kilogram (mg/kg) to 68 mg/kg. All of these detections fall below the RIDEM action level for TPH of 100 ppm.

- No VOCs were detected during the analysis of either subsurface soil samples collected from SB-11.

- Two phthalate esters were detected in the subsurface soil samples collected from SB-11, (di-n-butylphthalate at 970 μg/kg in sample SB-11-07; and bis(2-ethylhexyl)phthalate at 48 μg/kg and di-n-butylphthalate at 780 μg/kg in sample SB-11-12). These compounds are common laboratory contaminants.



SB-11

Sample Designation	SB-11-07	SB-11-12
Sample Depth (feet bgs)	5-7	10-12
Parameter		
SVOCs (µg/kg)		
Benzoic Acid	ND	81
Di-n-Butylphthalate	970	780
Dibenzofuran	470	ND
Bis(2-ethylhexyl)phthalate	ND	48
2-Methylnapthalene	11,000	96
Naphthalene	4,400	ND
TPH (mg/kg)	68	5.1

SB-10

Sample Designation	SB-10-06	SB-10-08
Sample Depth (feet bgs)	4-6	6-8
Parameter		
VOCs (µg/kg)		
Ethylbenzene	100	ND
Methylene Chloride	8	ND
m-xylene	44	ND
o-xylene	93	ND
SVOCs (µg/kg)		
Dibenzofuran	260	ND
2-Methylnapthalene	7,600	ND
Naphthalene	3,400	ND
TPH (mg/kg)	29	28

FIGURE 5-7

NORTH SMITHFIELD ANGS

ANALYTICAL RESULTS
AOC A - SOIL BORINGS

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

- Of the four other SVOC compounds detected in samples collected from SB-11; 2-methylnaphthalene was the only compound detected at both depth intervals. Concentrations of this compound reduced from 11,000 μg/kg in the 5 to 7 foot depth interval, to 96 μg/kg in the 10-to 12-foot depth interval.

- No inorganic compounds were detected at concentrations which exceeded three times the background concentration in any of the samples collected from AOC A.

5.4.5 Conclusions

Compounds detected in subsurface soils collected from AOC A include low levels of fuel-related compounds and common laboratory or sampling artifacts. All detections of TPH were well below the RIDEM action level set for the Station of 100 ppm. No chlorinated compounds were detected in any of the laboratory analyses performed on the subsurface soil samples collected from AOC A. Based on these observations, AOC A appears to be free of any significant contamination.

5.5 Site Findings - AOC B - Fenceline Behind The Motor Vehicle Maintenance Facility

5.5.1 Geologic Investigation Results

Soils in this portion of the Station appear to consist of the upper sandy, friable till reported to be present at the top of Black Plain Hill. Soil descriptions noted in the soil boring logs for borings SB-01 and SB-02 (Appendix C) show these soils contain fine sands with varying amounts of gravels and silt. A groundwater divide appears to be present in this portion of the Station. As shown in Figure 5-1 and 5-2, groundwater is generally interpreted to flow towards the north at AOC B. However, due to the proximity of the interpreted groundwater divide and potential variations in the groundwater elevation during various times of the year, the direction of groundwater flow may change at different times of the year.

5.5.2 Passive Soil Gas Survey Results

The results of the passive soil gas survey identified the potential presence of BTEX in three different areas at AOC B, and the potential presence of heavier hydrocarbons near the western extent of AOC B. Twelve sampler tubes were placed in the vicinity of AOC B. Analysis of these tubes showed levels of fuel-related compounds from non-detect to moderate levels, based on the statistical analysis of the data, as shown in Figures 5-4 and 5-5. Two smaller areas were identified within AOC B as potentially being contaminated with higher levels of these fuel-related compounds near the western and eastern ends of AOC B.

5.5.3 GC Screening Results

Six subsurface soil samples collected during the advancement of soil borings SB-01 and SB-02 at AOC B were screened on-site with the portable GC. Specifically, these samples were screened for BTEX, TCE, TCA, DCE, and PCE. Figure 5-8 presents the locations and depths at which compounds were detected by the GC screening. Complete results of the GC screening are presented in Appendix B.

Total xylenes were detected in three of the four samples collected from SB-01 at concentrations ranging from 80 ppbv to 364 ppbv. Total xylenes were also detected in one of the two samples collected from SB-02 at a concentration of 93 ppbv.

5.5.4 Soils

Two soil borings were advanced at AOC B as described in Section 4.0. The locations of these soil borings were determined based on the results of the passive soil gas survey discussed in Section 5.2. The first soil boring, SB-01, was sampled continuously to refusal, approximately 8.4 feet bgs. The second boring, SB-02, was sampled at 5-foot intervals to the groundwater table, approximately 7 feet bgs. Boring SB-02 was advanced to a total depth of 10 feet bgs to evaluate the feasibility of installing a groundwater monitoring well at AOC B.

Four subsurface soil samples, two from each soil boring advanced at AOC B, were submitted to the off-site laboratory for chemical analysis. Two surface soil samples were collected for off-site analysis at location SS-02 and SS-03 at AOC B. A summary of the analytical data for the surface and subsurface soil samples are presented in Figures 5-9 and 5-10, respectively.

Significant observations from the analysis of the samples collected include:

- No PCBs were detected in any of the surface soil samples collected.
- TPH was detected in SS-02 and SS-03 at concentrations of 5.1 mg/kg and 4.4 mg/kg, respectively. However, TPH was detected in the background sample at a concentration of 9.1 mg/kg, higher than in either of the other two surface soil samples.
- One VOC, toluene, was detected in samples SS-02 and SS-03 at concentrations of 30 μg/kg and 13 μg/kg, respectively. However, as noted with respect to TPH, the highest detection of toluene was found in the background sample SS-01, detected at a concentration of 48 μg/kg.
- Benzoic acid was detected in samples SS-02 and SS-03 at concentrations of 640 μg/kg and 320 μg/kg, respectively. However, benzoic acid was also detected in the background sample SS-01 at a concentration of 600 μg/kg.

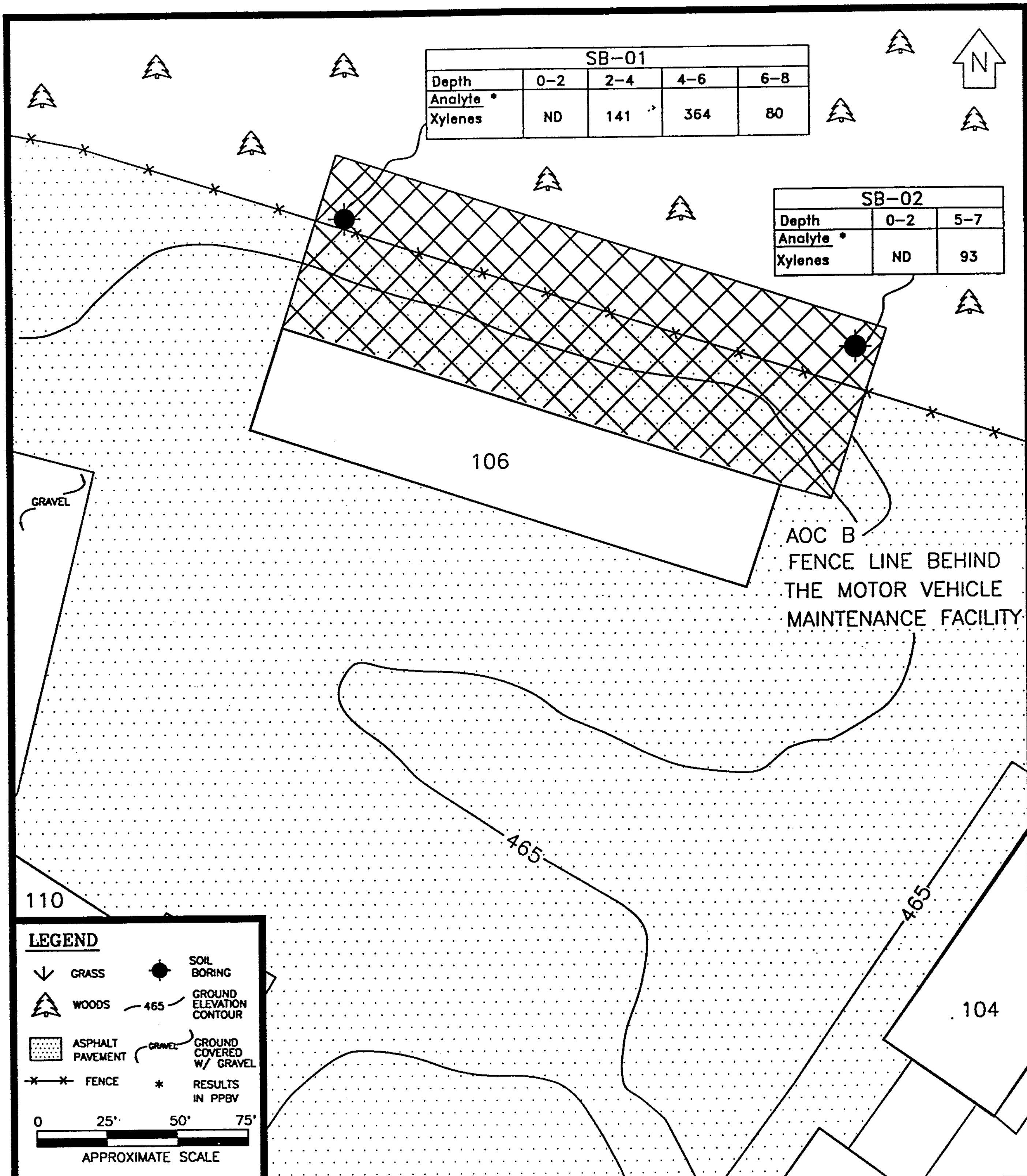


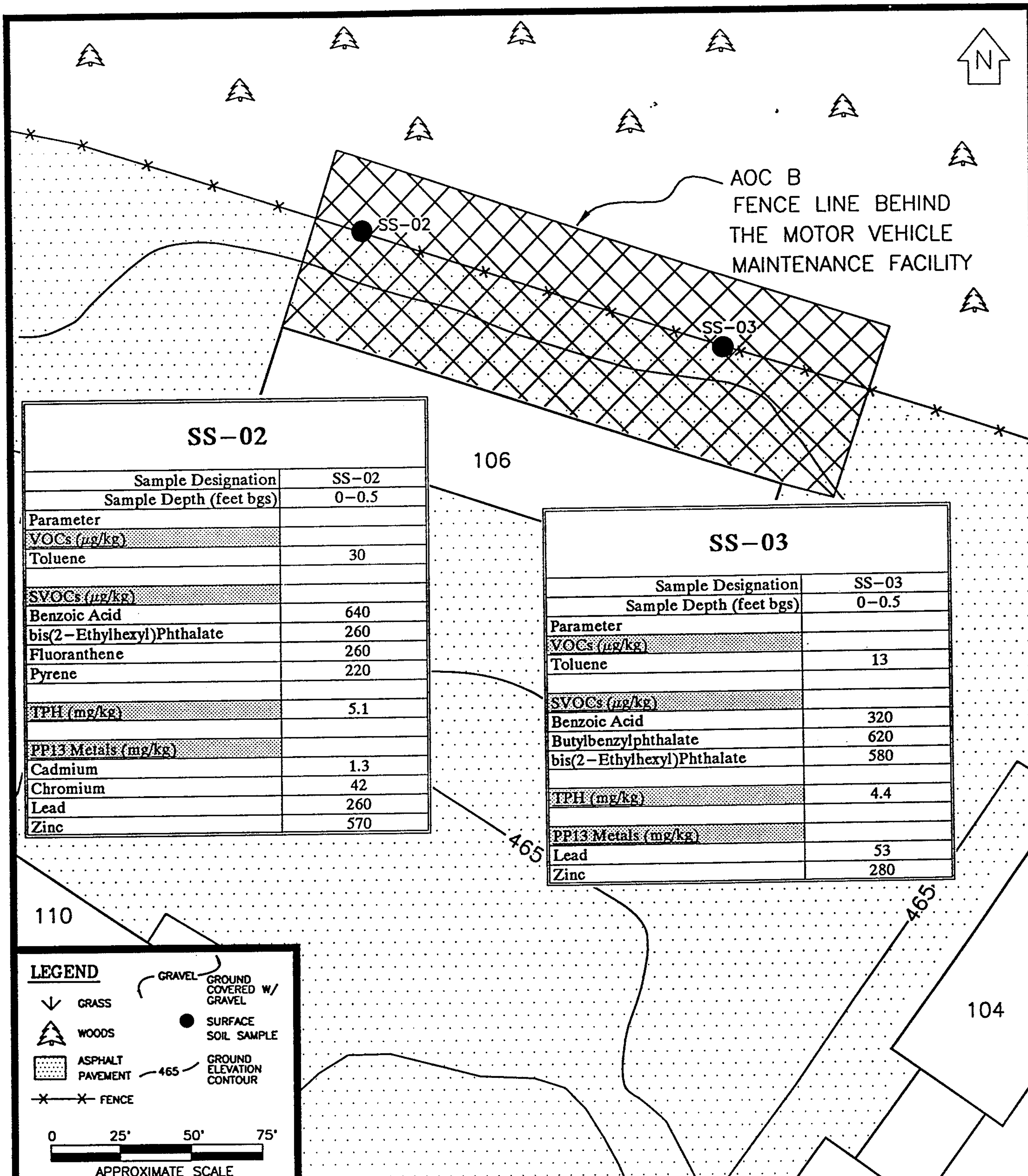
FIGURE 5-8

NORTH SMITHFIELD ANGS

FIELD GC SCREENING RESULTS
AOC B – SOIL BORINGS

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies



SS-02

Sample Designation	SS-02
Sample Depth (feet bgs)	0-0.5
Parameter	
VOCs (µg/kg)	
Toluene	30
SVOCs (µg/kg)	
Benzoic Acid	640
bis(2-Ethylhexyl)Phthalate	260
Fluoranthene	260
Pyrene	220
TPH (mg/kg)	5.1
PP13 Metals (mg/kg)	
Cadmium	1.3
Chromium	42
Lead	260
Zinc	570

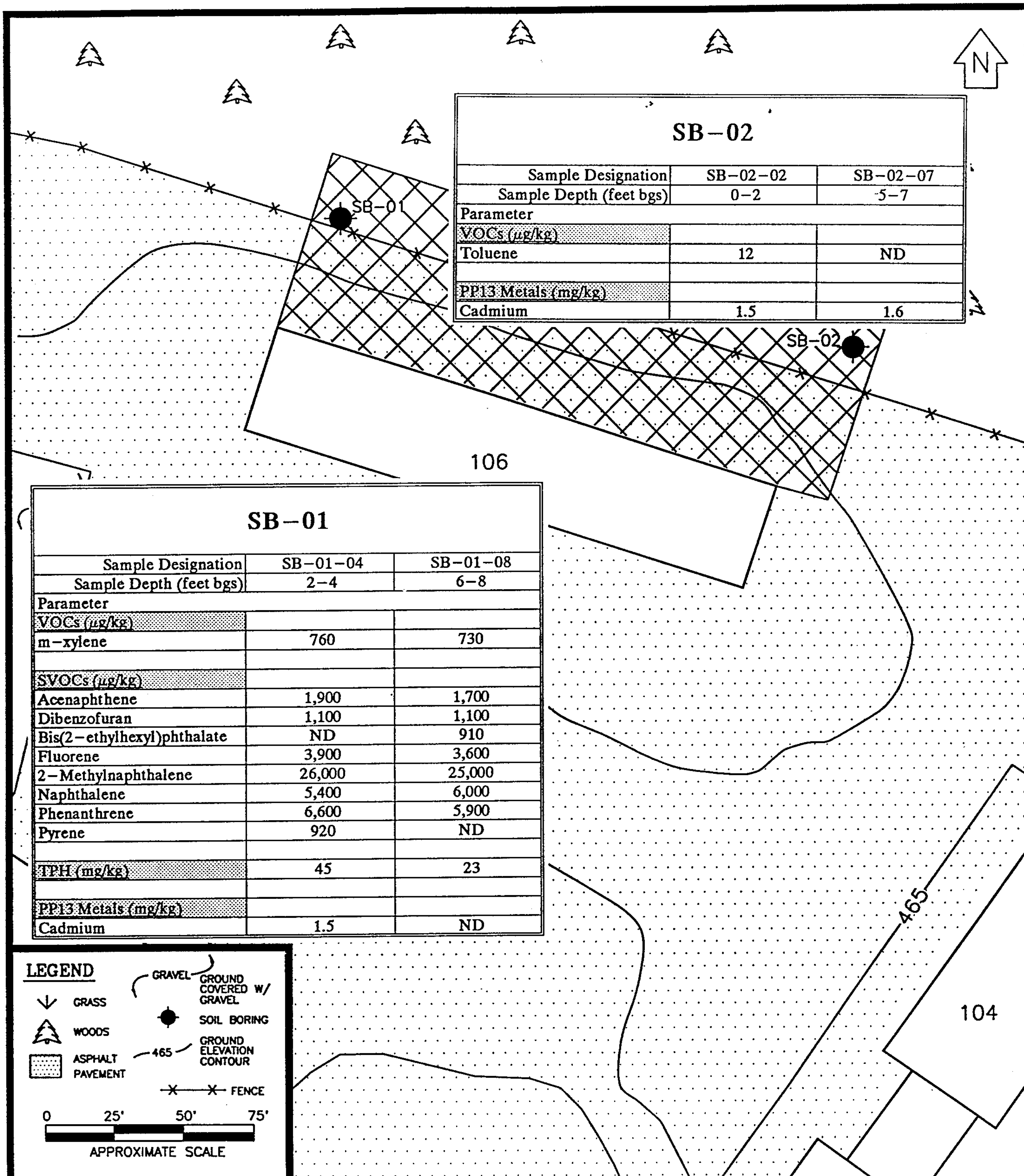
SS-03

Sample Designation	SS-03
Sample Depth (feet bgs)	0-0.5
Parameter	
VOCs (µg/kg)	
Toluene	13
SVOCs (µg/kg)	
Benzoic Acid	320
Butylbenzylphthalate	620
bis(2-Ethylhexyl)Phthalate	580
TPH (mg/kg)	4.4
PP13 Metals (mg/kg)	
Lead	53
Zinc	280

FIGURE 5-9

NORTH SMITHFIELD ANGS
ANALYTICAL RESULTS
AOC B
SURFACE SOIL SAMPLES
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies



SB-02

Sample Designation	SB-02-02	SB-02-07
Sample Depth (feet bgs)	0-2	5-7
Parameter		
VOCs (µg/kg)		
Toluene	12	ND
PP13 Metals (mg/kg)		
Cadmium	1.5	1.6

SB-01

Sample Designation	SB-01-04	SB-01-08
Sample Depth (feet bgs)	2-4	6-8
Parameter		
VOCs (µg/kg)		
m-xylene	760	730
SVOCs (µg/kg)		
Acenaphthene	1,900	1,700
Dibenzofuran	1,100	1,100
Bis(2-ethylhexyl)phthalate	ND	910
Fluorene	3,900	3,600
2-Methylnaphthalene	26,000	25,000
Naphthalene	5,400	6,000
Phenanthrene	6,600	5,900
Pyrene	920	ND
TPH (mg/kg)	45	23
PP13 Metals (mg/kg)		
Cadmium	1.5	ND

FIGURE 5-10

NORTH SMITHFIELD ANGS

ANALYTICAL RESULTS
AOC B - SOIL BORINGS

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

- Only one VOC, m-xylene, was detected in the samples collected from SB-01. Concentrations of 760 μg/kg and 730 μg/kg were detected in samples collected from the 2-to 4-foot and 6-to 8-foot depth intervals, respectively. One VOC, toluene at a concentration of 12 μg/kg, was detected in samples SB-02-02. No VOCs were detected in sample SB-02-07.

- One phthalate ester was detected in sample SB-01-08, bis(2-ethylhexyl)phthalate at a concentration of 910 μg/kg. As noted previously, this compound is a common laboratory contaminant.

- Bis(2-ethylhexyl)phthalate was detected in all three surface soil samples (the two collected at AOC B and the background sample). Butylbenzylphthalate was detected at a concentration of 620 μg/kg in sample SS-03. As noted previously, these compounds are common laboratory contaminants.

- Six SVOCs (acenaphthene, dibenzofuran, fluorene, 2-methylnaphthalene, naphthalene, and phenanthrene) were detected in both samples collected from SB-01. Concentrations of the compounds varied from 1100 μg/kg to 26,000 μg/kg and did not change significantly between the two depth intervals sampled (i.e., 2 to 4 feet and 6 to 8 feet bgs). The only other SVOC detected was pyrene in sample SB-01-04 at a concentration of 920 μg/kg.

- Lead and zinc were detected in sample SS-02 at concentrations approximately 5.8 and 8.6 times their respective reference criteria (i.e., three times the concentration detected in the background sample). Cadmium and chromium were also detected in sample SS-02, however these detections were only slightly above their respective reference criteria.

- Zinc was detected in sample SS-03 at a concentration approximately 4.2 times its reference criteria. Lead was also detected in sample SS-03, however, the concentration detected only slightly exceeded the reference criteria.

- The only inorganic compound detected above reference criteria in subsurface soil was cadmium, detected in samples SB-01-04 and SB-02-02 at a concentration of 1.5 mg/kg and in sample SB-02-07 at a concentration of 1.6 mg/kg. Cadmium was not detected in either of the background subsurface soil samples. The reporting limits for cadmium in the two background subsurface soil samples were 0.64 mg/kg and 0.67 mg/kg.

- TPH was detected in samples SB-01-04 and SB-01-08 at concentrations of 45 mg/kg and 23 mg/kg, respectively. Both of these concentrations are below the action level set for TPH of 100 ppm.

- Neither TPH nor SVOCs were detected in samples collected from boring SB-02.

5.5.5 Conclusions

Contaminants detected during chemical analysis of the subsurface soil samples include one phthalate ester, fuel-related compounds, and cadmium. The detection of bis(2-ethylhexyl)phthalate is considered to be a laboratory or sampling artifact.

Toluene, detected at low concentrations in the two surface soil samples, is consistent with the contaminant release history reported for AOC B. Toluene was not detected at depth in either of the soil borings advanced at AOC B.

TPH was detected in the two surface soil samples collected at AOC B, at concentrations well below the action level for TPH of 100 ppm. Also, the concentrations of TPH detected in surface soils at AOC B are approximately one half the concentration detected in the background surface soil sample. These detections are likely due to surface runoff from the paved areas of the Station, as opposed to historical chemical releases. Fuel-related compounds were detected in subsurface soils, however, the concentrations detected do not exceed the action level for TPH of 100 ppm.

Cadmium was detected at low levels in three of the four subsurface soil samples collected from AOC B. Cadmium was also detected a several other locations throughout the Station at approximately the same concentrations as those detected at AOC B.

5.6 Site Findings - AOC C Former Paint/Solvent Storage Building

5.6.1 Geologic Investigation Results

Soils in this portion of the Station appear to consist of the upper sandy, friable till reported to be present at the top of Black Plain Hill. Soil descriptions noted in the soil boring logs for borings SB-03 and SB-04 (Appendix C) show these soils contain fine sands with varying amounts of gravel and silts. Groundwater was not encountered within soil borings SB-03 and SB-04.

5.6.2 Passive Soil Gas Survey Results

Analysis of the passive soil gas sampler tubes placed in the vicinity of AOC C detected levels of BTEX ranging from non-detect to low level detections. One sampler installed south of AOC C contained moderate levels of BTEX (Figure 5-4). Analysis of the sampler tubes installed in this area did not detect any of the heavier hydrocarbons, as illustrated in Figure 5-5.

5.6.3 GC Screening Results

Six subsurface soil samples collected at AOC C were screened on-site with the portable GC. As noted previously, samples were screened for BTEX, TCE, TCA, DCE, and PCE.

Figure 5-11 presents the locations and depths at which compounds were detected by the GC screening. Complete results of the GC screening are presented in Appendix B.

GC screening performed on the four samples collected from SB-03 detected only one compound, ethylbenzene, at a concentration of 164 ppbv in the sample collected from the 10-to 12-foot depth interval. Screening of the two samples collected from SB-04 detected ethylbenzene at 111 ppbv, and PCE at 1207 ppbv.

5.6.4 Soils

Two soil borings were advanced at AOC C as described in Section 4.0. The locations of these soil borings were selected to investigate the potential for subsurface contamination in the vicinity of AOC C while avoiding damaging the leachfield piping. The first boring, SB-03, was sampled continuously to refusal of the split spoon sampler and the hollow stem auger at approximately 12 feet bgs. Due to the nature of the subsurface material at the location of SB-03 (e.g., gravelly fill used to build the leachfield), insufficient material was recovered in the split spoon samplers over the first three depth intervals to submit to the off-site laboratory for chemical analysis.

Four subsurface soil samples, two from each soil boring advanced at AOC C, were submitted to the off-site laboratory for chemical analysis. A summary of the analytical data for soil borings SB-03 and SB-04 are presented in Figure 5-12.

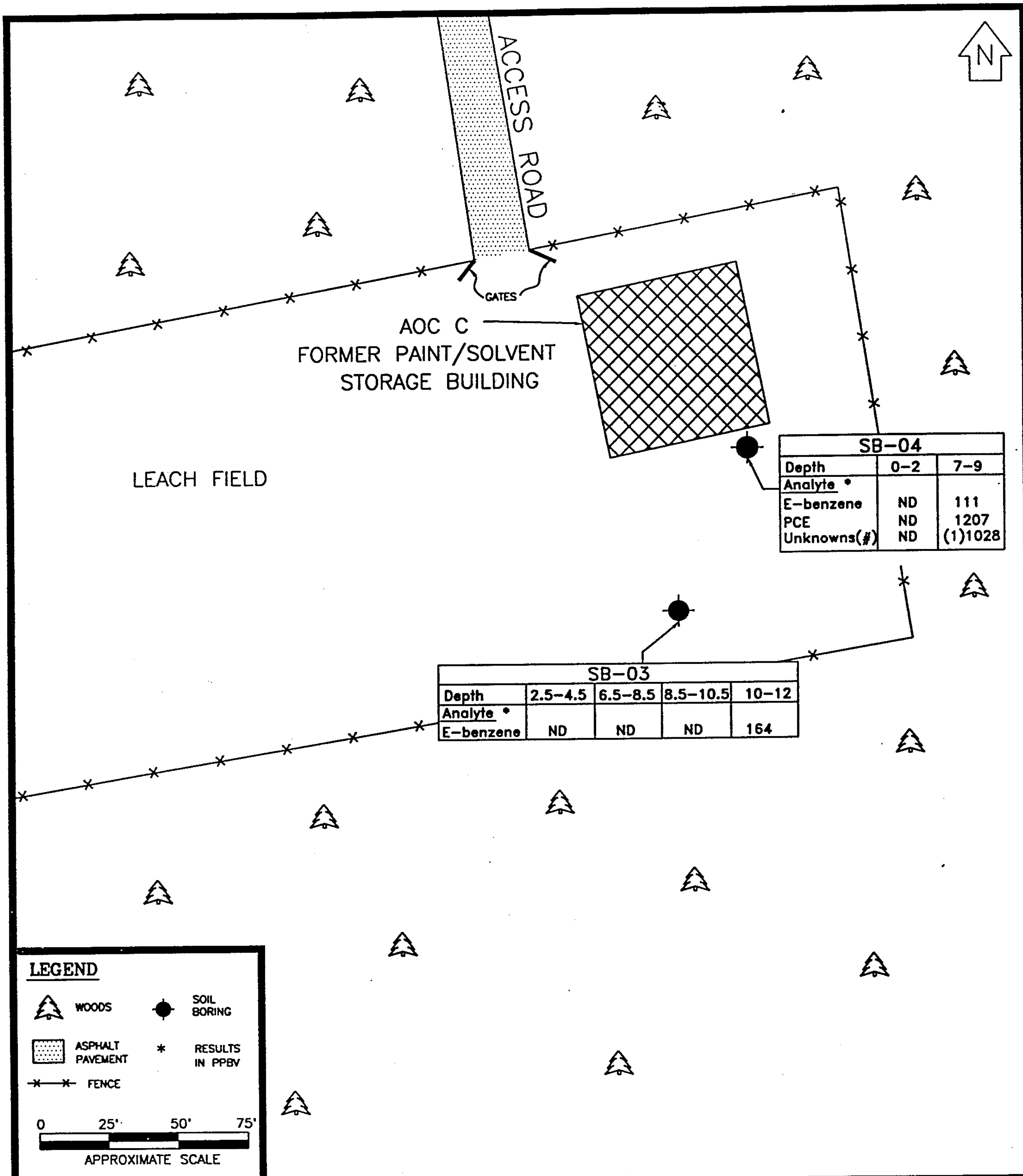
Significant observations from the analysis of the samples collected include:

- Three VOCs were detected in sample SB-03-8.5, acetone, toluene, and m-xylene at concentrations of 73 μg/kg, 10 μg/kg, and 8 μg/kg, respectively. No other detections of VOCs were encountered at AOC C. Acetone is a common laboratory artifact.

- Twenty-one SVOCs were detected in sample SB-03-8.5, ranging in concentration from 180 μg/kg to 22,000 μg/kg. Only 8 of these SVOC compounds were detected in the deeper sample, SB-03-12, with the concentrations of these 8 compounds being two orders of magnitude lower than the shallower sample.

- Twelve of the SVOCs detected in sample SB-03-8.5 were also detected in sample SB-04-09, at concentrations ranging from 430 μg/kg to 4,500 μg/kg. No SVOCs were detected in sample SB-04-02.

- Arsenic was detected in samples SB-03-8.5 and SB-04-09 at concentrations of 5.2 mg/kg and 2.6 mg/kg, respectively. Cadmium was detected in all four samples collected from AOC C, at concentrations ranging from 0.84 mg/kg to 1.5 mg/kg. Neither of these compounds was detected in the background samples. Reporting limits for arsenic and cadmium were approximately 0.22 mg/kg and 0.67 mg/kg.



SB-04		
Depth	0-2	7-9
Analyte *		
E-benzene	ND	111
PCE	ND	1207
Unknowns(#)	ND	(1)1028

SB-03				
Depth	2.5-4.5	6.5-8.5	8.5-10.5	10-12
Analyte *				
E-benzene	ND	ND	ND	164

FIGURE 5-11

NORTH SMITHFIELD ANGS

FIELD GC SCREENING RESULTS

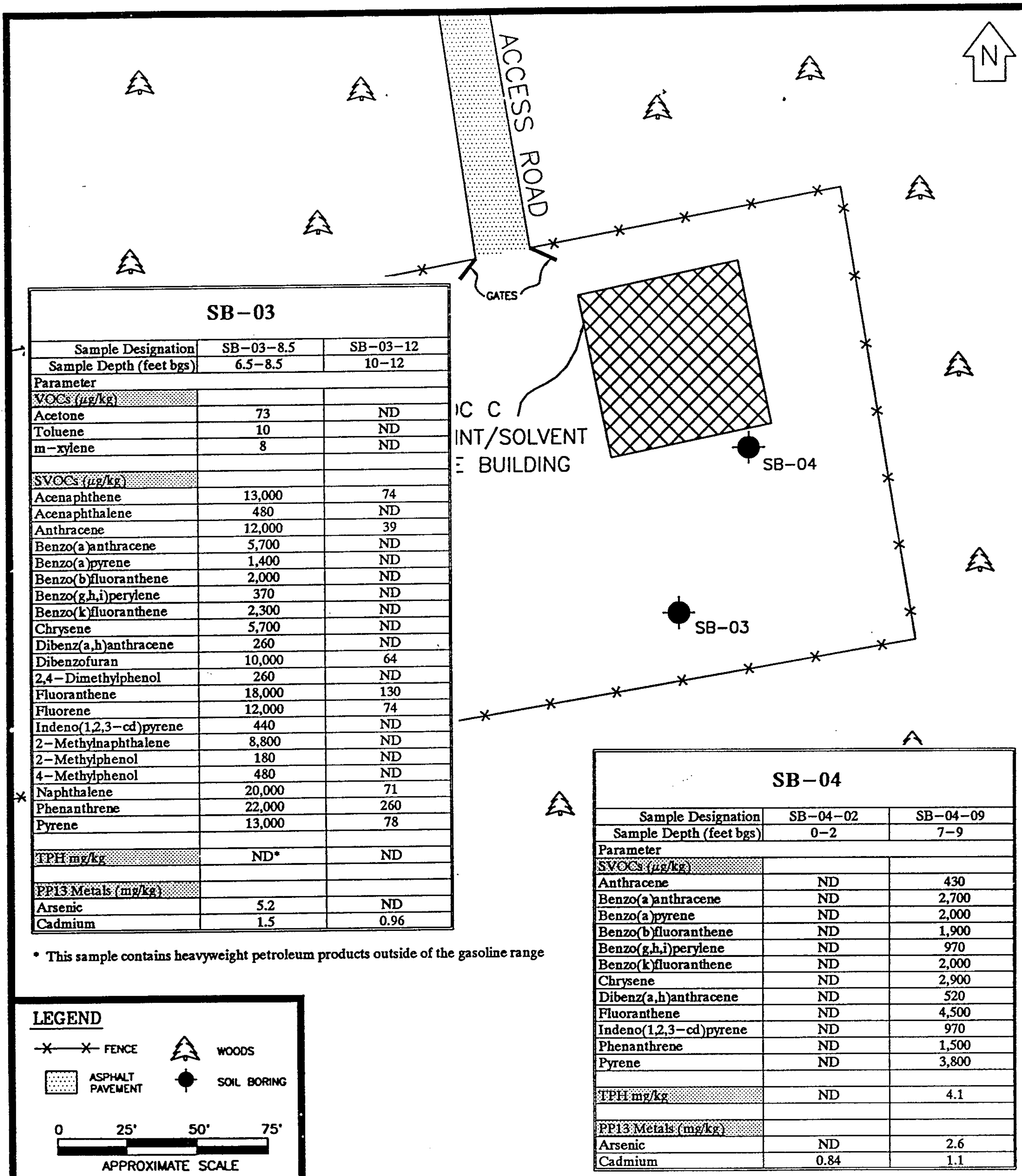
AOC C – SOIL BORINGS

102ND AIR CONTROL SQUADRON

SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION

Analytic, Environmental and Process Technologies



SB-03

Sample Designation	SB-03-8.5	SB-03-12
Sample Depth (feet bgs)	6.5-8.5	10-12
Parameter		
VOCs (µg/kg)		
Acetone	73	ND
Toluene	10	ND
m-xylene	8	ND
SVOCs (µg/kg)		
Acenaphthene	13,000	74
Acenaphthalene	480	ND
Anthracene	12,000	39
Benzo(a)anthracene	5,700	ND
Benzo(a)pyrene	1,400	ND
Benzo(b)fluoranthene	2,000	ND
Benzo(g,h,i)perylene	370	ND
Benzo(k)fluoranthene	2,300	ND
Chrysene	5,700	ND
Dibenz(a,h)anthracene	260	ND
Dibenzofuran	10,000	64
2,4-Dimethylphenol	260	ND
Fluoranthene	18,000	130
Fluorene	12,000	74
Indeno(1,2,3-cd)pyrene	440	ND
2-Methylnaphthalene	8,800	ND
2-Methylphenol	180	ND
4-Methylphenol	480	ND
Naphthalene	20,000	71
Phenanthrene	22,000	260
Pyrene	13,000	78
TPH mg/kg	ND*	ND
PP13 Metals (mg/kg)		
Arsenic	5.2	ND
Cadmium	1.5	0.96

* This sample contains heavyweight petroleum products outside of the gasoline range

SB-04

Sample Designation	SB-04-02	SB-04-09
Sample Depth (feet bgs)	0-2	7-9
Parameter		
SVOCs (µg/kg)		
Anthracene	ND	430
Benzo(a)anthracene	ND	2,700
Benzo(a)pyrene	ND	2,000
Benzo(b)fluoranthene	ND	1,900
Benzo(g,h,i)perylene	ND	970
Benzo(k)fluoranthene	ND	2,000
Chrysene	ND	2,900
Dibenz(a,h)anthracene	ND	520
Fluoranthene	ND	4,500
Indeno(1,2,3-cd)pyrene	ND	970
Phenanthrene	ND	1,500
Pyrene	ND	3,800
TPH mg/kg	ND	4.1
PP13 Metals (mg/kg)		
Arsenic	ND	2.6
Cadmium	0.84	1.1

FIGURE 5-12

NORTH SMITHFIELD ANGS

ANALYTICAL RESULTS
AOC C - SOIL BORINGS

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

5.6.5 Conclusions

Contaminants detected during laboratory analysis of subsurface soil samples collected from AOC C included numerous SVOCs, VOCs, TPH, arsenic, and cadmium. The subsurface soil sample collected from SB-03 at the 6.5 to 8.5-foot depth interval was found to contain 21 SVOCs at concentrations up to 22,000 μg/kg. All of these compounds are considered to be site-related contaminants. As noted in the soil boring log for SB-03, presented in Appendix C, this depth interval corresponds to the depth at which the soil boring had advanced through the leachfield and encountered native material. This native material would be expected to have a higher organic carbon content and a lower hydraulic conductivity than the leachfield which may have promoted accumulation of these compounds at this depth interval.

It is noted that the sample collected from the 10-to 12-foot depth interval in SB-03 was found to contain only 8 of these compounds at concentrations two orders of magnitude less than these detected in the 6.5 to 8.5 foot depth interval. Also, after advancing boring SB-03 to bedrock, the hole was allowed to remain open overnight. After more than 23 hours, there was no water present in the borehole. Based on these two observations, it appears that migration of these compounds from this area is limited.

Low levels of VOCs appear to be present in soil boring SB-03 in the 6.5 to 8.5 foot depth interval. These compounds were not detected in the deeper sample collected from SB-03. No VOCs were detected in samples collected from SB-04. Therefore, the extent of these compounds appears to be limited.

TPH was detected in sample SB-04-09 at a concentration of 4.1 mg/kg, which is well below the action level set for TPH of 100 ppm.

5.7 Other Pertinent Information

In addition to the three identified AOCs, a number of other areas which may have contained subsurface contamination were identified by the passive soil gas survey. These areas were discussed in Section 5.3. These areas were investigated by the advancement of soil borings and the collection and screening of subsurface soil samples using a portable GC with subsequent laboratory analysis on select samples. The results of investigative activities conducted at each of these areas are discussed below.

5.7.1 Area adjacent to Building 111

5.7.1.1 Geologic Investigation Results

Soils in this portion of the Station appear to consist of the upper sandy, friable till reported to be present at the top of Black Plain Hill. Soil descriptions noted in the soil boring log for SB-05 (Appendix C) show these soils consist of fine sands with trace amounts of silt and coarse to fine gravel. Groundwater in this portion of the Station is interpreted to flow towards

the south.

5.7.1.2 GC Screening Results

Four subsurface soil samples were collected from SB-05 and screened on-site with the portable GC. As noted previously, samples were screened for BTEX, TCE, TCA, DCE, and PCE. Figure 5-13 presents the locations and depths at which compounds were detected by the GC screening. Complete results of the GC screening are presented in Appendix B.

Total xylenes were detected in samples SB-05-07, SB-05-12, and SB-05-16, at concentrations of 390 ppbv, 528 ppbv, and 1,430 ppbv, respectively. PCE was also detected in sample SB-05-07 at a concentration of 1,190 ppbv.

5.7.1.3 Soils

Two subsurface soil samples collected from SB-05, advanced at soil gas sampler location 21 near Building 111, were submitted to the off-site laboratory for chemical analysis for VOCs, SVOCs, TPH, and PP13 metals. A summary of the analytical data for soil boring SB-05 are presented in Figure 5-14.

Significant observations from the analysis of the samples collected include:

- No VOCs or SVOCs were detected in either sample collected from SB-05.
- TPH was not detected in either sample collected from soil boring SB-05.
- Cadmium was the only inorganic compound detected above its respective reference concentration. Cadmium was detected at a concentration of 1.6 mg/kg in both samples SB-05-07 and SB-05-16. Cadmium was not detected in either background sample and had a reporting limit of 0.67 mg/kg.

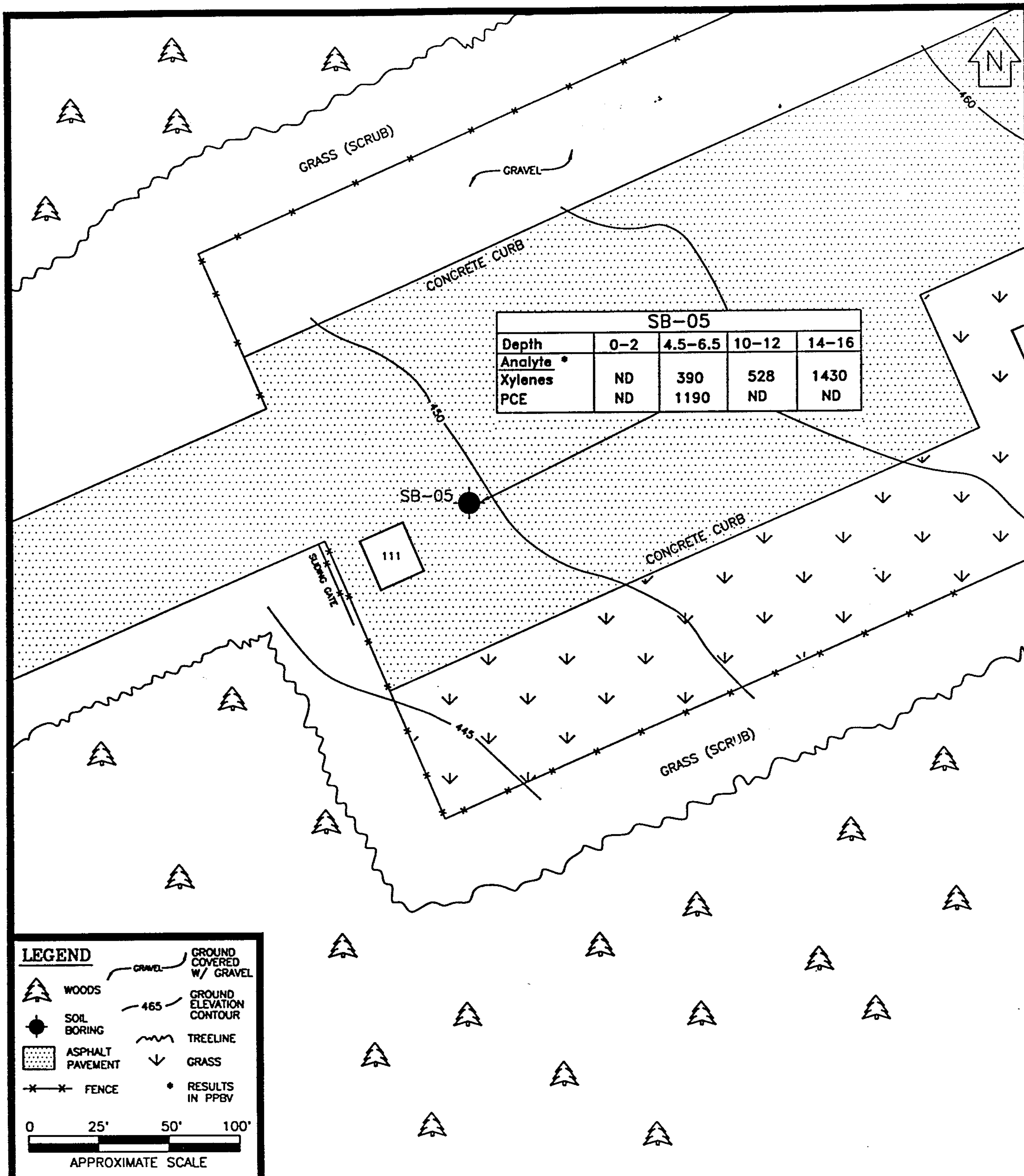
5.7.1.4 Conclusions

GC screening of the subsurface soil samples identified the presence of total xylenes. No other identifiable compounds were detected. Chemical analysis of the two samples submitted to the off-site laboratory detected only the presence of low levels of cadmium. This area of the Station appears to be generally free of contamination.

5.7.2 Area West of Building 108

5.7.2.1 Geologic Investigation Results

Soils in this portion of the Station appear to consist of the upper sandy, friable till reported to be present at the top of Black Plain Hill. Soil descriptions noted in the soil boring



SB-05				
Depth	0-2	4.5-6.5	10-12	14-16
Analyte *				
Xylenes	ND	390	528	1430
PCE	ND	1190	ND	ND

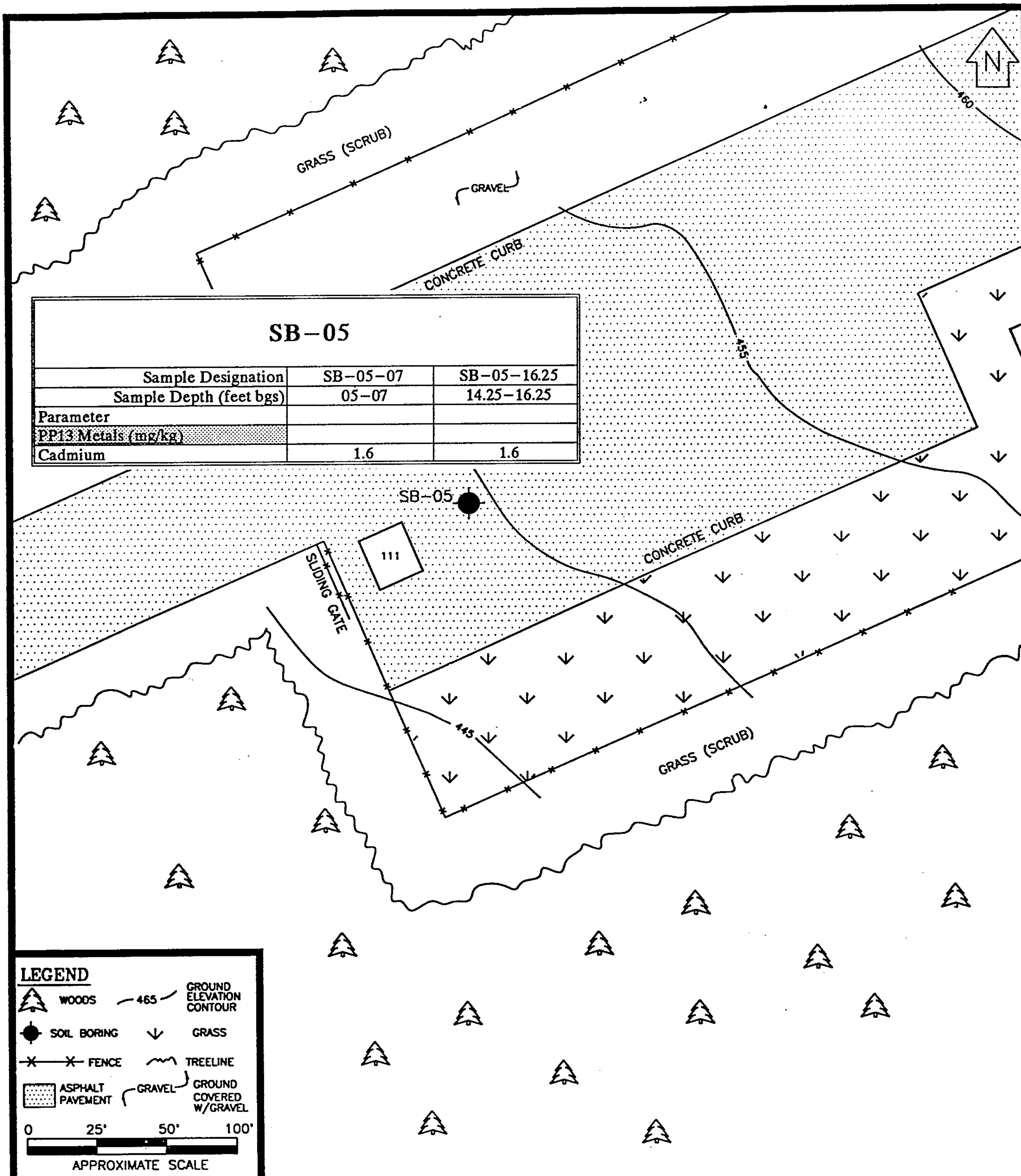
FIGURE 5-13

NORTH SMITHFIELD ANGS

FIELD GC SCREENING RESULTS
AREA ADJACENT TO BUILDING 111

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies



SB-05

Sample Designation	SB-05-07	SB-05-16.25
Sample Depth (feet bgs)	05-07	14.25-16.25
Parameter		
PP13 Metals (mg/kg)		
Cadmium	1.6	1.6

FIGURE 5-14

NORTH SMITHFIELD ANGS
ANALYTICAL RESULTS
AREA ADJACENT TO BUILDING 111
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

log for SB-13 (Appendix C) show these soils consist of fine sand with trace amounts of silt and coarse to fine sand and gravel. Groundwater in this portion of the Station is interpreted to flow towards the south.

5.7.2.2 GC Screening Results

Three subsurface soil samples were collected from soil boring SB-13, which was advanced at soil gas sampler location 43. These samples were screened for BTEX, TCE, TCA, DCE, and PCE, using the portable GC. Figure 5-15 presents the locations and depths at which compounds were detected by the GC screening. Complete results of the GC screening are presented in Appendix B. No identifiable compounds were detected during screening of the samples collected from SB-13.

5.7.2.3 Soils

Two subsurface soil samples collected from SB-13 were submitted to the off-site laboratory for chemical analysis. A summary of the analytical data for soil boring SB-13 are presented in Figure 5-16.

Significant observations from the analysis of the samples collected include:

- The only VOC detected was toluene, in sample SB-13-2.5.
- Eight SVOCs were detected in sample SB-13-02.5, ranging in concentration from 190 μg/kg to 590 μg/kg. No SVOCs were detected in the deeper sample, SB-13-07.
- No inorganic compounds were detected at concentrations exceeding their respective reference concentrations in either sample collected from SB-13.

5.7.2.4 Conclusions

GC screening of the subsurface soil samples collected from SB-13 did not detect any identifiable compounds. Chemical analysis of the sample submitted to the off-site laboratory detected the presence of fuel-related compounds, including toluene, in the sample collected from the 0-to 2.5-foot depth interval. Analysis of the sample collected from the 5-to 7-foot depth interval found no detections of any organic compounds. The compounds detected in the shallow sample may be related to components of the asphalt pavement in this area leaching into the shallow subsurface. Migration of these compounds appears to be limited as they were not detected at depth. Generally, this area appears to be free of contamination.

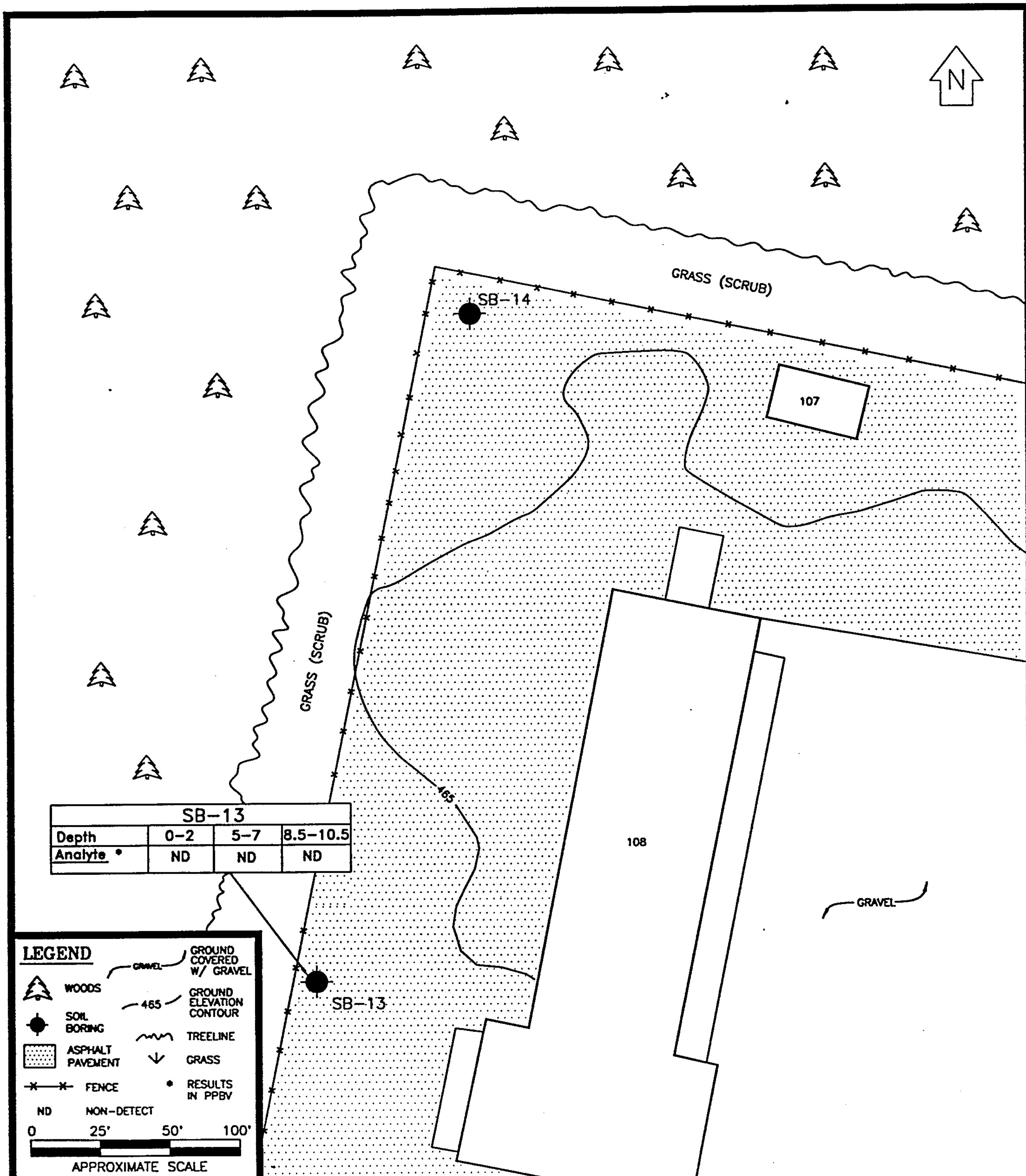


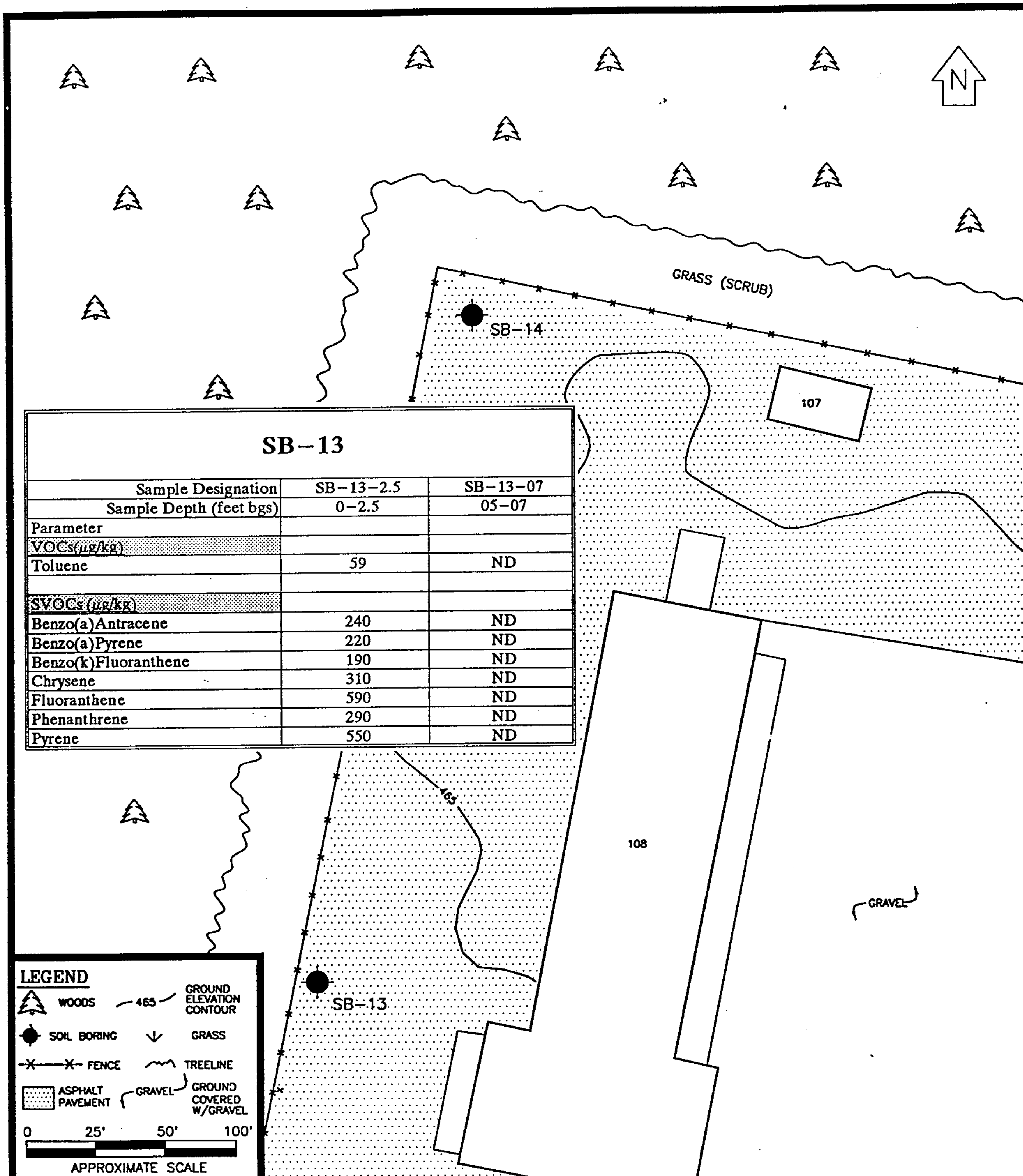
FIGURE 5-15

NORTH SMITHFIELD ANGS

FIELD GC SCREENING RESULTS
AREA WEST OF BUILDING 108

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies



SB-13

Sample Designation	SB-13-2.5	SB-13-07
Sample Depth (feet bgs)	0-2.5	05-07
Parameter		
VOCs(µg/kg)		
Toluene	59	ND
SVOCs (µg/kg)		
Benzo(a)Antracene	240	ND
Benzo(a)Pyrene	220	ND
Benzo(k)Fluoranthene	190	ND
Chrysene	310	ND
Fluoranthene	590	ND
Phenanthrene	290	ND
Pyrene	550	ND

FIGURE 5-16

NORTH SMITHFIELD ANGS
ANALYTICAL RESULTS
AREA WEST OF BUILDING 108
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

5.7.3 Area Southeast of Building 107

5.7.3.1 Geologic Investigation Results

Soils in this portion of the Station appear to consist of the upper sandy, friable till reported to be present at the top of Black Plain Hill. Soil descriptions noted in the soil boring log for SB-12 (Appendix C), show these soils contain coarse to fine sands and sandy silts. A groundwater divide appears to be present in this portion of the Station. As shown in Figure 5-1 and 5-2, Building 107 appears to be located immediately over the groundwater divide. Therefore, the direction of groundwater flow may change at different times of the year.

5.7.3.2 GC Screening Results

Three subsurface soil samples were collected from SB-12, which was advanced in the vicinity of the area identified as potentially contaminated with fuel-related compounds. These samples were screened for BTEX, TCE, TCA, DCE, and PCE, using the portable GC. Figure 5-17 presents the locations and depths at which compounds were detected by the GC screening. Complete results of the GC screening are presented in Appendix B.

5.7.3.3 Soils

Two subsurface soil samples collected from SB-12 were submitted to the off-site laboratory for chemical analysis. A summary of the analytical data for soil boring SB-12 are presented in Figure 5-18.

Significant observations from the analysis of the samples collected include:

- No VOCs were detected in either sample collected from soil boring SB-12.
- Benzoic acid was detected in sample SB-12-07 at a concentration of 64 μg/kg. Benzoic acid was not detected in the deeper sample SB-12-12.
- Bis(2-ethylhexyl)phthalate was detected in both samples SB-12-07 and SB-12-12 at concentrations of 53 μg/kg and 81 μg/kg, respectively. As noted previously, this compound is a common laboratory contaminant.
- No inorganic compounds were detected at concentrations exceeding their respective reference concentrations in either sample collected from soil boring SB-12.

5.7.3.4 Conclusions

GC screening of the subsurface soil samples collected from boring SB-12 did not detect the presence of any identifiable compounds. Chemical analysis of the samples submitted to the off-site laboratory detected only benzoic acid and bis(2-ethylhexyl)phthalate. The concentrations

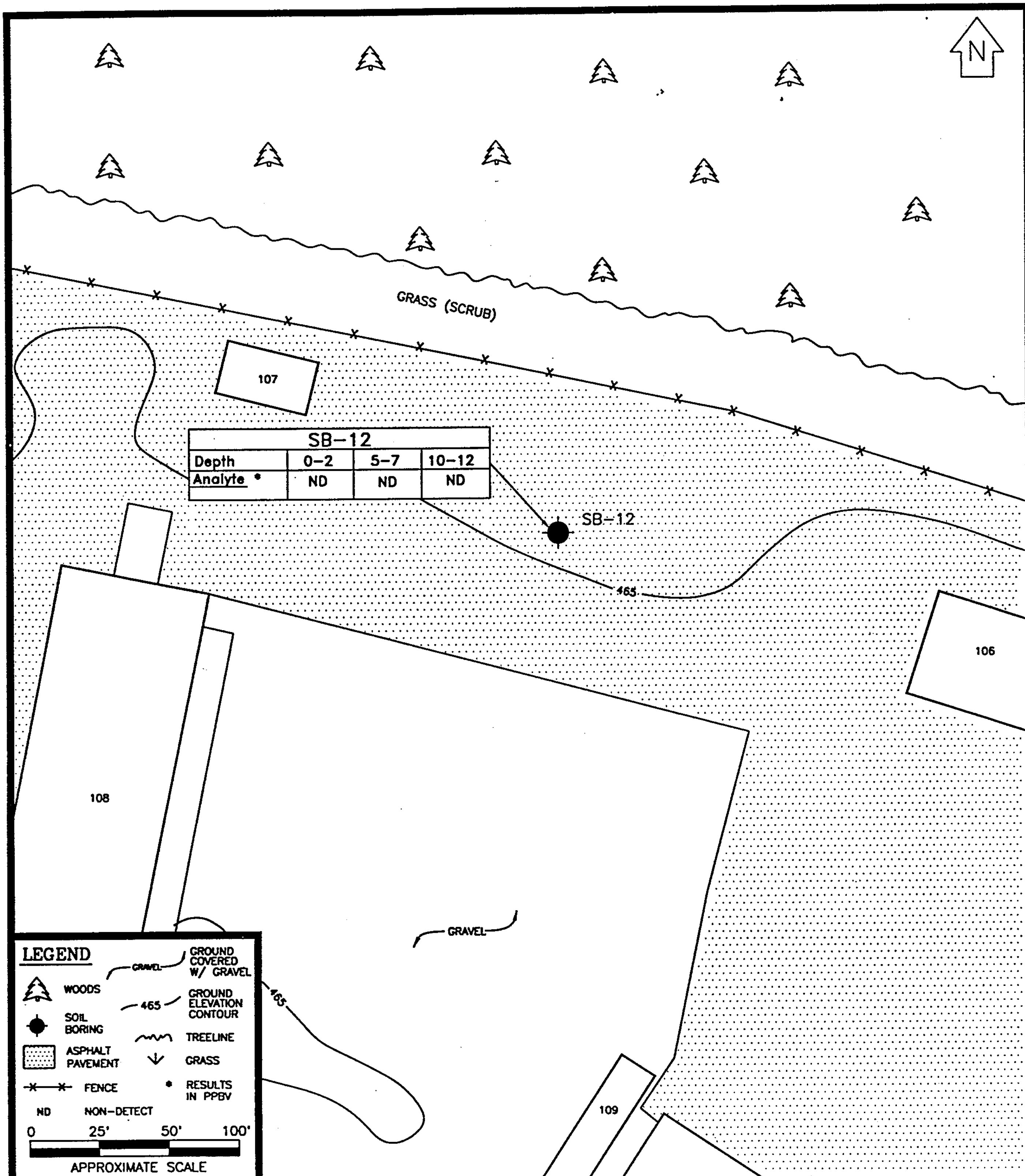


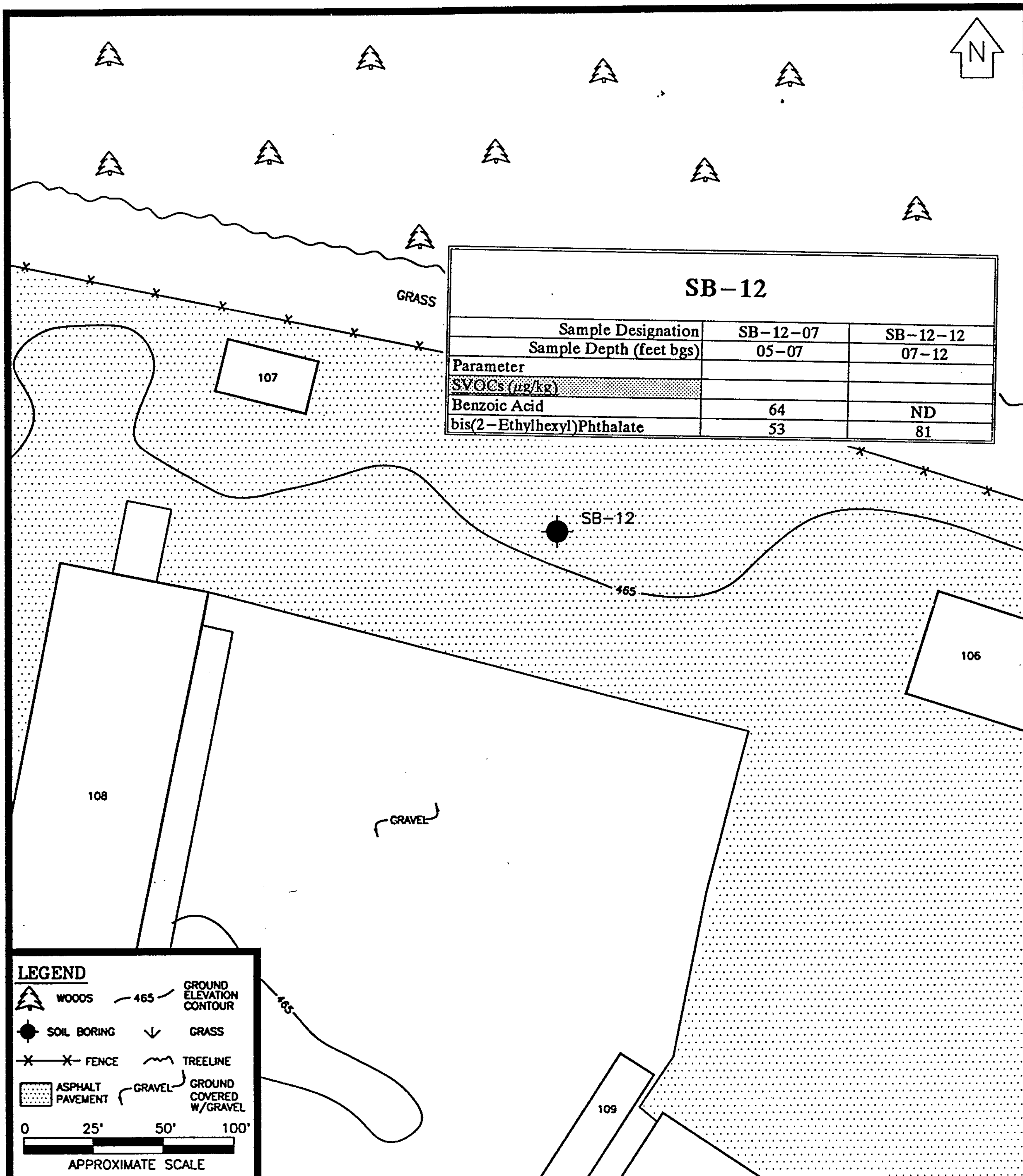
FIGURE 5-17

NORTH SMITHFIELD ANGS

FIELD GC SCREENING RESULTS
AREA SOUTHEAST OF BUILDING 107

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies



SB-12

Sample Designation	SB-12-07	SB-12-12
Sample Depth (feet bgs)	05-07	07-12
Parameter		
SVOCs (µg/kg)		
Benzoic Acid	64	ND
bis(2-Ethylhexyl)Phthalate	53	81

FIGURE 5-18

NORTH SMITHFIELD ANGS

ANALYTICAL RESULTS
AREA SOUTHEAST OF BUILDING 107

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

of bis(2-ethylhexyl)phthalate fall well within the criteria set by the U.S. EPA for evaluating phthalate esters as site-related contaminants. Bis(2-ethylhexyl)phthalate is a common laboratory contaminant.

5.7.4 Linear Area in the Central Portion of the Station

5.7.4.1 Geologic Investigation Results

Soils in this portion of the Station appear to consist of the upper sandy, friable till reported to be present at the top of Black Plain Hill. Soil descriptions noted in the soil boring logs for SB-08 and SB-09 (Appendix C) show these soils consist of fine sands with trace amounts of coarser sand, silt, and coarse to fine gravel. Groundwater in this portion of the Station is interpreted to flow towards the southwest.

5.7.4.2 GC Screening Results

Five subsurface soil samples collected during the advancement of soil borings SB-08 and SB-09, in the linear area in the central portion of the Station, were screened on-site with the portable GC. As noted previously, samples were screened for BTEX, TCE, TCA, DCE, and PCE. Figure 5-19 presents the locations and depths at which compounds were detected by the GC screening. Complete results of the GC screening are presented in Appendix B.

Total xylenes were detected in sample SB-08-07.5 at a concentration of 287 ppbv. No other detections of known or unknown compounds were encountered in soil boring SB-08. Ethylbenzene and total xylenes were detected in sample SB-09-07.5, at concentrations of 110 ppbv and 92 ppbv, respectively.

5.7.4.3 Soils

Four subsurface soil samples, two from both SB-08 and SB-09, were submitted to the off-site laboratory for chemical analysis. Figure 5-20 presents a summary of the analytical data for SB-08 and SB-09.

Significant observations from the analysis of the samples collected include:

- Two VOCs, acetone and toluene were detected in sample SB-08-02.5, at concentrations of 26 μg/kg and 8 μg/kg, respectively. No VOCs were detected in the deeper sample, SB-08-07. Acetone is a common laboratory contaminant.

- Bis(2-ethylhexyl)phthalate was detected in sample SB-08-02.5 at a concentration of 350 μg/kg. This compound is a common laboratory contaminant.

- Fluoranthene and pyrene were detected in sample SB-08-02.5 at a concentration of 390 μg/kg.

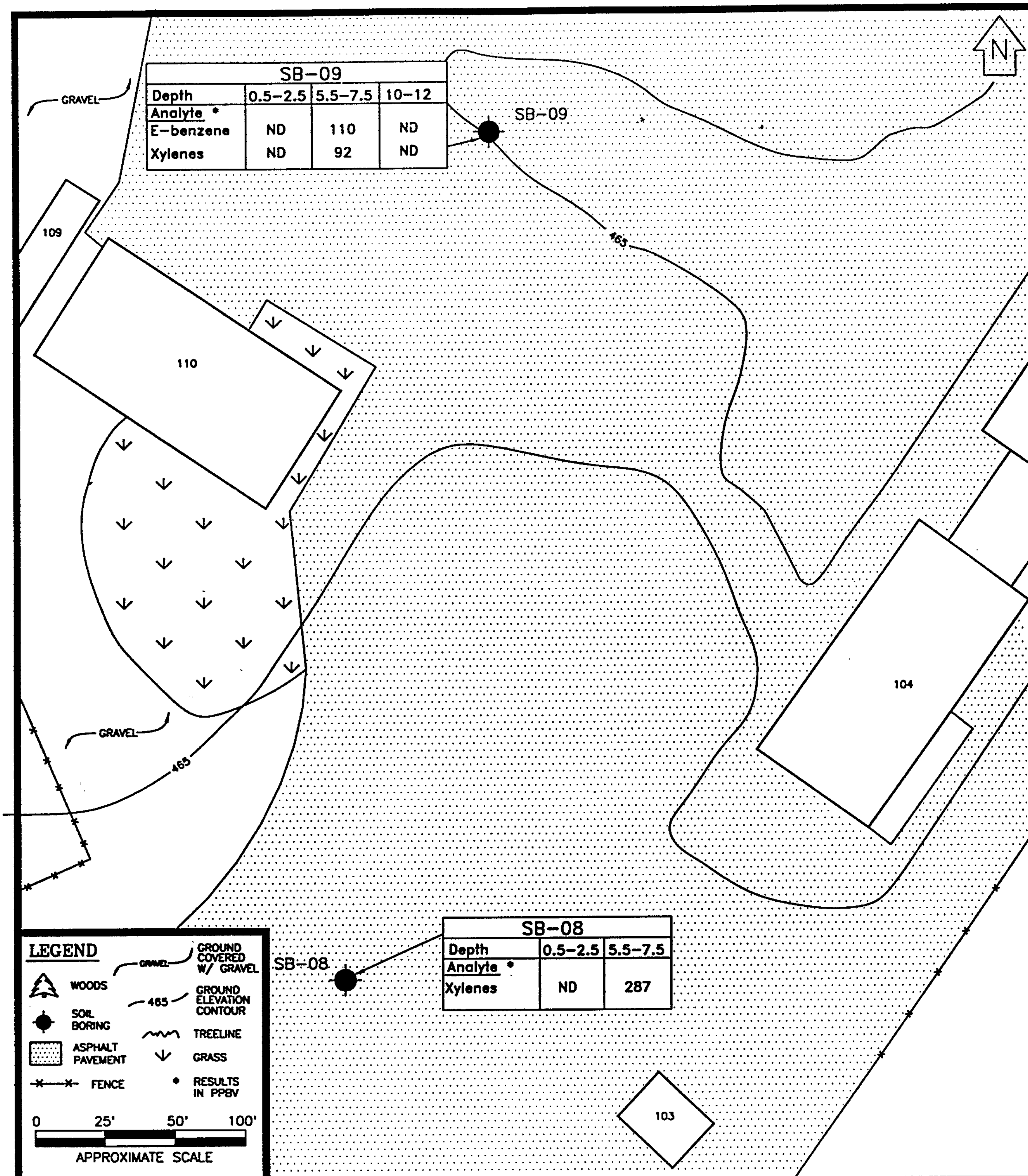
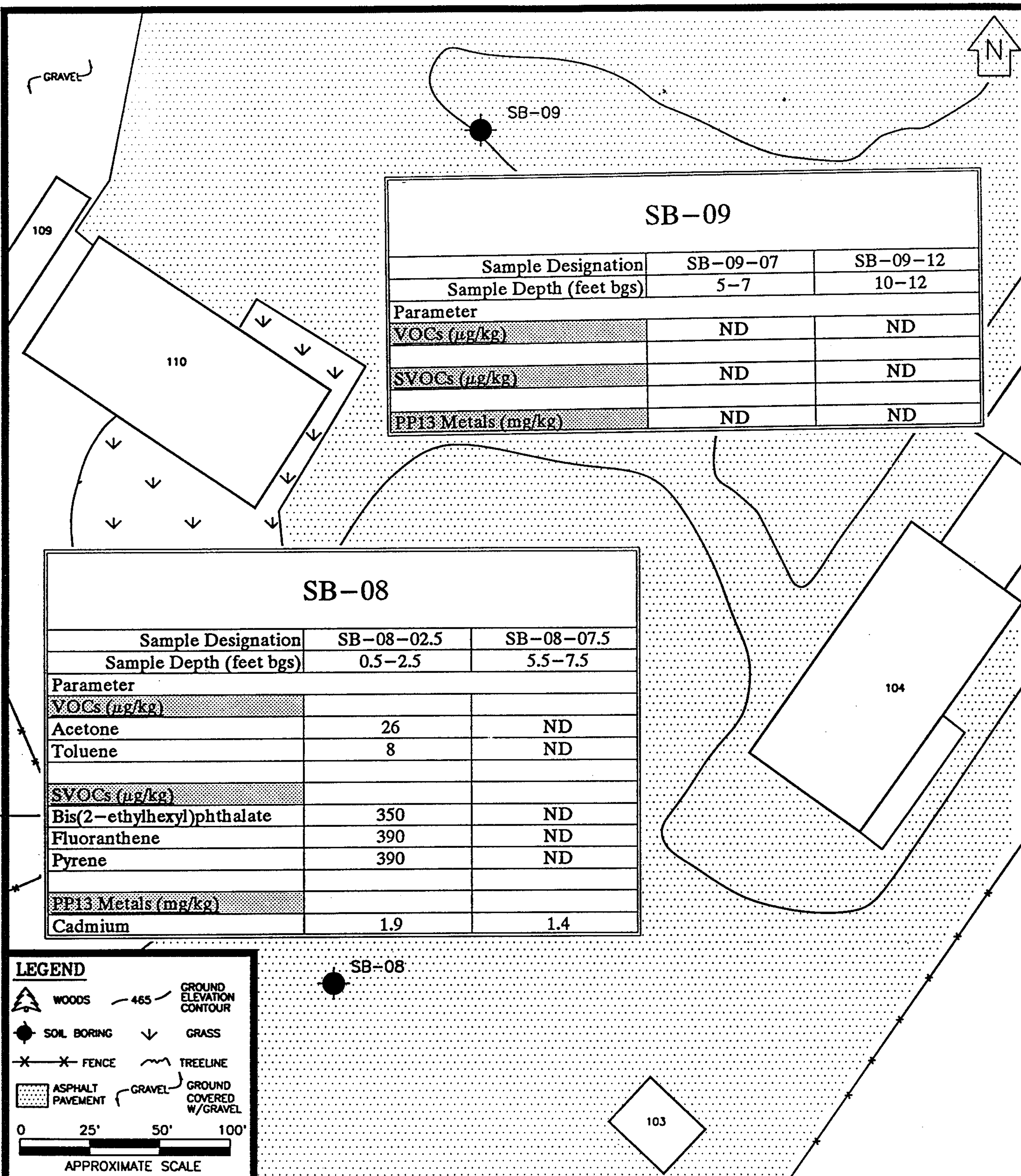


FIGURE 5-19

NORTH SMITHFIELD ANGS
FIELD GC SCREENING RESULTS
LINEAR AREA IN CENTRAL
PORTION OF THE STATION
102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies



SB-09

Sample Designation	SB-09-07	SB-09-12
Sample Depth (feet bgs)	5-7	10-12
Parameter		
VOCs (µg/kg)	ND	ND
SVOCs (µg/kg)	ND	ND
PP13 Metals (mg/kg)	ND	ND

SB-08

Sample Designation	SB-08-02.5	SB-08-07.5
Sample Depth (feet bgs)	0.5-2.5	5.5-7.5
Parameter		
VOCs (µg/kg)		
Acetone	26	ND
Toluene	8	ND
SVOCs (µg/kg)		
Bis(2-ethylhexyl)phthalate	350	ND
Fluoranthene	390	ND
Pyrene	390	ND
PP13 Metals (mg/kg)		
Cadmium	1.9	1.4

FIGURE 5-20

NORTH SMITHFIELD ANGS

ANALYTICAL RESULTS LINEAR AREA IN CENTRAL PORTION OF THE STATION

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

- No SVOCs were detected in sample SB-08-07.5.

- TPH was not detected in any of the four samples collected from soil borings SB-08 and SB-09.

- The only inorganic compound detected at a concentration exceeding its reference concentration was cadmium, detected in samples SB-08-02.5 and SB-08-07.5 at concentrations of 1.9 μg/kg and 1.4 μg/kg, respectively. Cadmium was not detected in either of the background samples, and had a reporting limit of approximately 0.67 mg/kg.

- No VOCs, SVOCs, or inorganic compounds at concentrations exceeding their respective reference concentrations were detected in either of the samples collected from SB-09.

5.7.4.4 Conclusions

Based on the results of the chemical analyses performed, it appears that the presence of contaminants in the shallow subsurface soils in soil boring SB-08 is limited and may be related to the asphalt pavement in this area.

5.7.5 Soil Borings Advanced at Soil Gas Sampler Locations 24 and 36

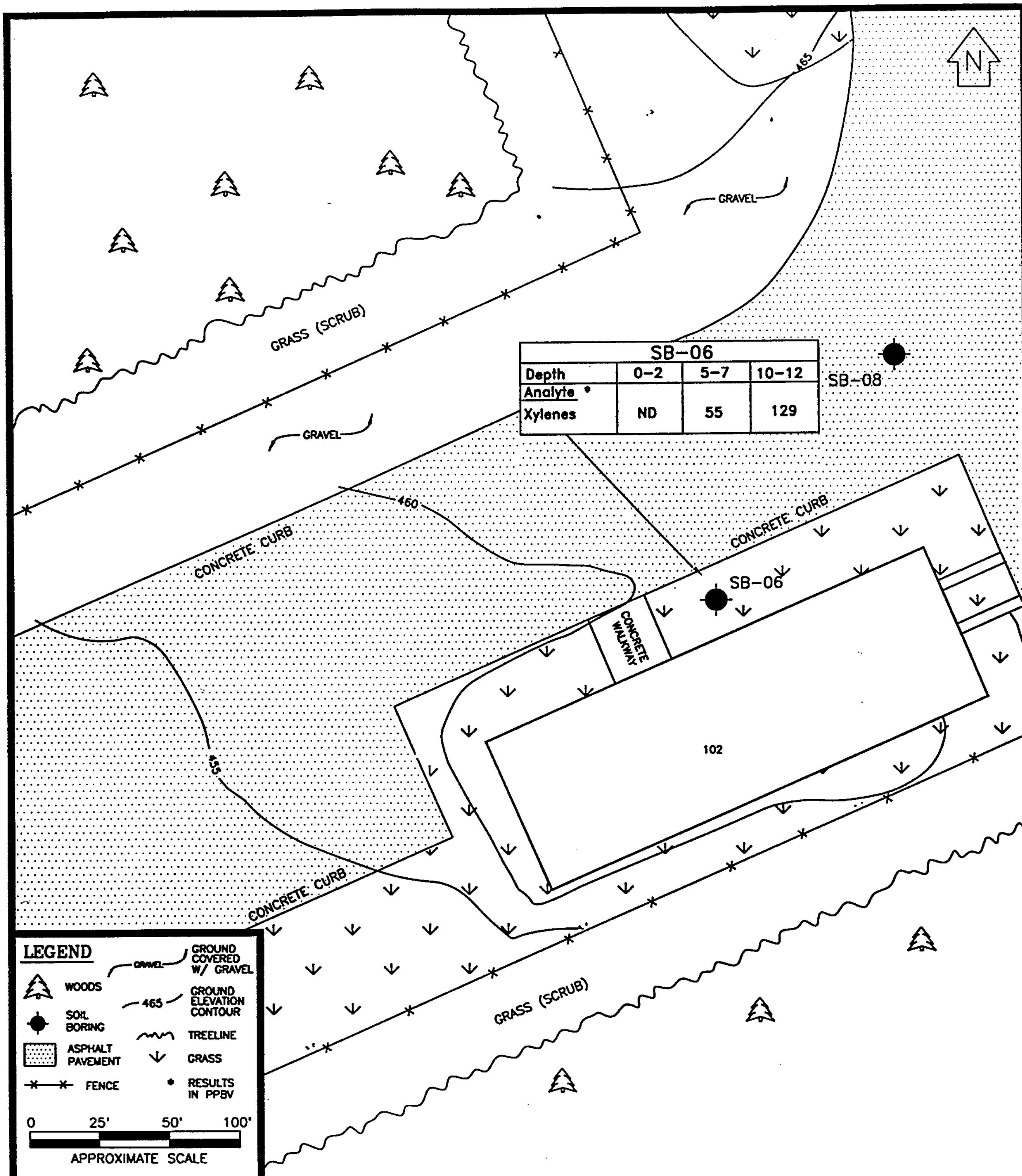
5.7.5.1 Geologic Investigation Results

Soils in theses portions of the Station also appear to consist of the upper sandy, friable till reported to be present at the top of Black Plain Hill. Soil descriptions noted in the soil boring logs for SB-06 and SB-07 (Appendix C) show these soils consist of fine sands with little silt and trace amounts of coarse to fine gravel. Groundwater in the vicinity of SB-06 is interpreted to flow towards the southwest. Groundwater was not encountered in SB-07 as refusal was encountered at a depth of 5 feet bgs.

5.7.5.2 GC Screening Results

Soil borings SB-06 and SB-07 were advanced at soil gas sampler locations 24 and 36, respectively, to confirm or refute the detections of chlorinated compounds at these locations. Four subsurface soil samples were collected from these soil borings and screened on-site with the portable GC. As noted previously, samples were screened for BTEX, TCE, TCA, DCE, and PCE. Figures 5-21 and 5-22 present the locations and depths at which compounds were detected by the GC screening during advancement of soil borings SB-06 and SB-07, respectively. Complete results of the GC screening are presented in Appendix B.

Samples SB-06-07 and SB-06-12 were found to contain total xylenes at concentrations of 55 ppbv and 129 ppbv, respectively. No detections of the target chlorinated compounds were encountered in any of the four samples collected.



SB-06			
Depth	0-2	5-7	10-12
Analyte *			
Xylenes	ND	55	129

NORTH SMITHFIELD ANGS

FIELD GC SCREENING RESULTS
SOIL BORING SB-06

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

FIGURE 5-21

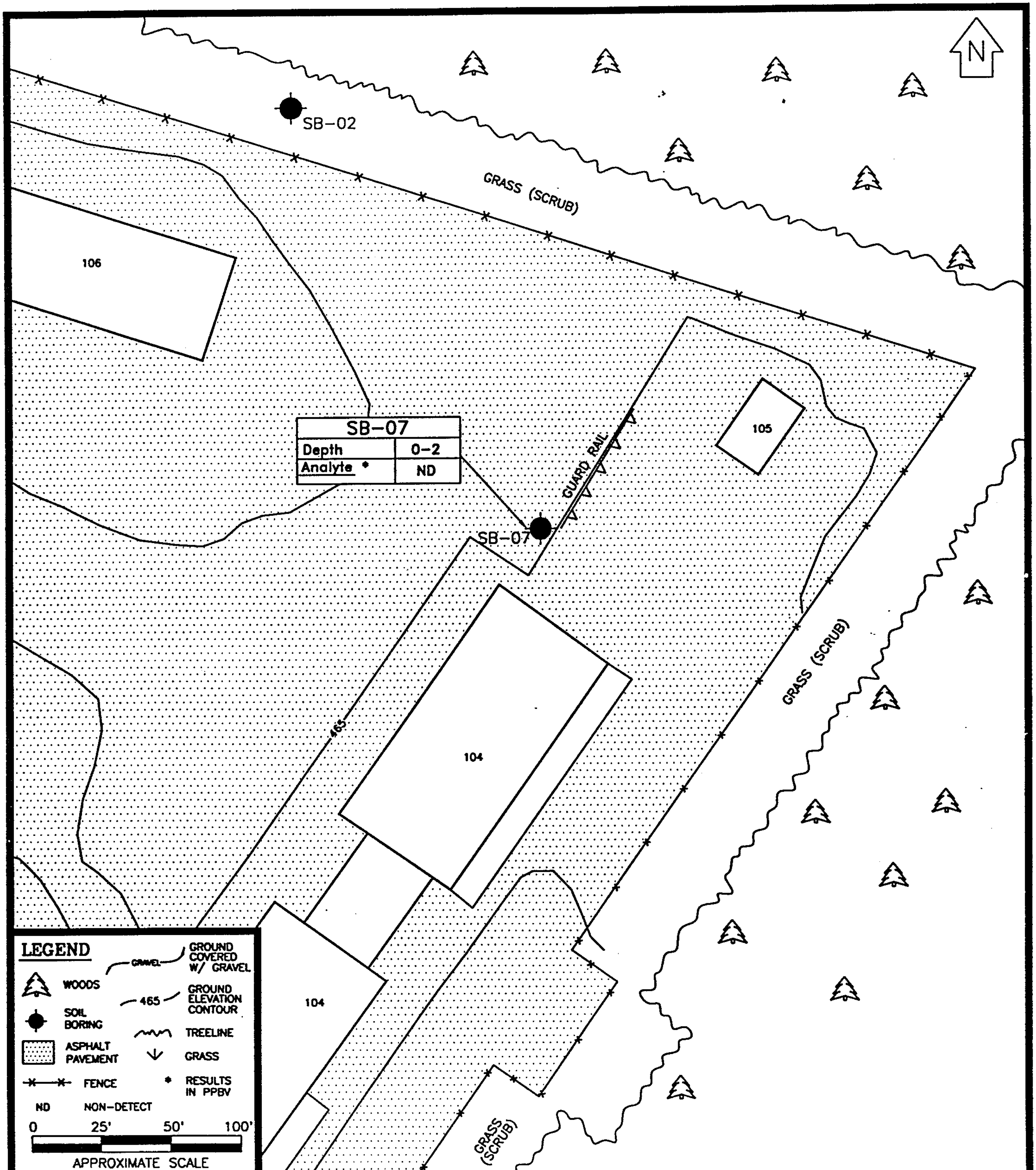


FIGURE 5-22

NORTH SMITHFIELD ANGS

FIELD GC SCREENING RESULTS
SOIL BORING SB-07

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

5.7.5.3 Soils

Two subsurface soil samples collected from SB-06, and one subsurface soil sample collected from SB-07, were submitted to the off-site laboratory for chemical analysis. Only one subsurface soil sample could be collected from SB-07 as refusal was encountered at approximately 5 feet bgs. A summary of the analytical data for SB-06 and SB-07 are presented in Figures 5-23 and 5-24, respectively.

Significant observations from the analysis of the samples collected include:

- No VOCs or SVOCs were detected in any of the three samples collected from these soil borings.

- TPH was detected in sample SB-07-02.5 at a concentration of 5.4 mg/kg. This concentration is well below the action level set for TPH, of 100 ppm. TPH was not detected in either of the other two samples.

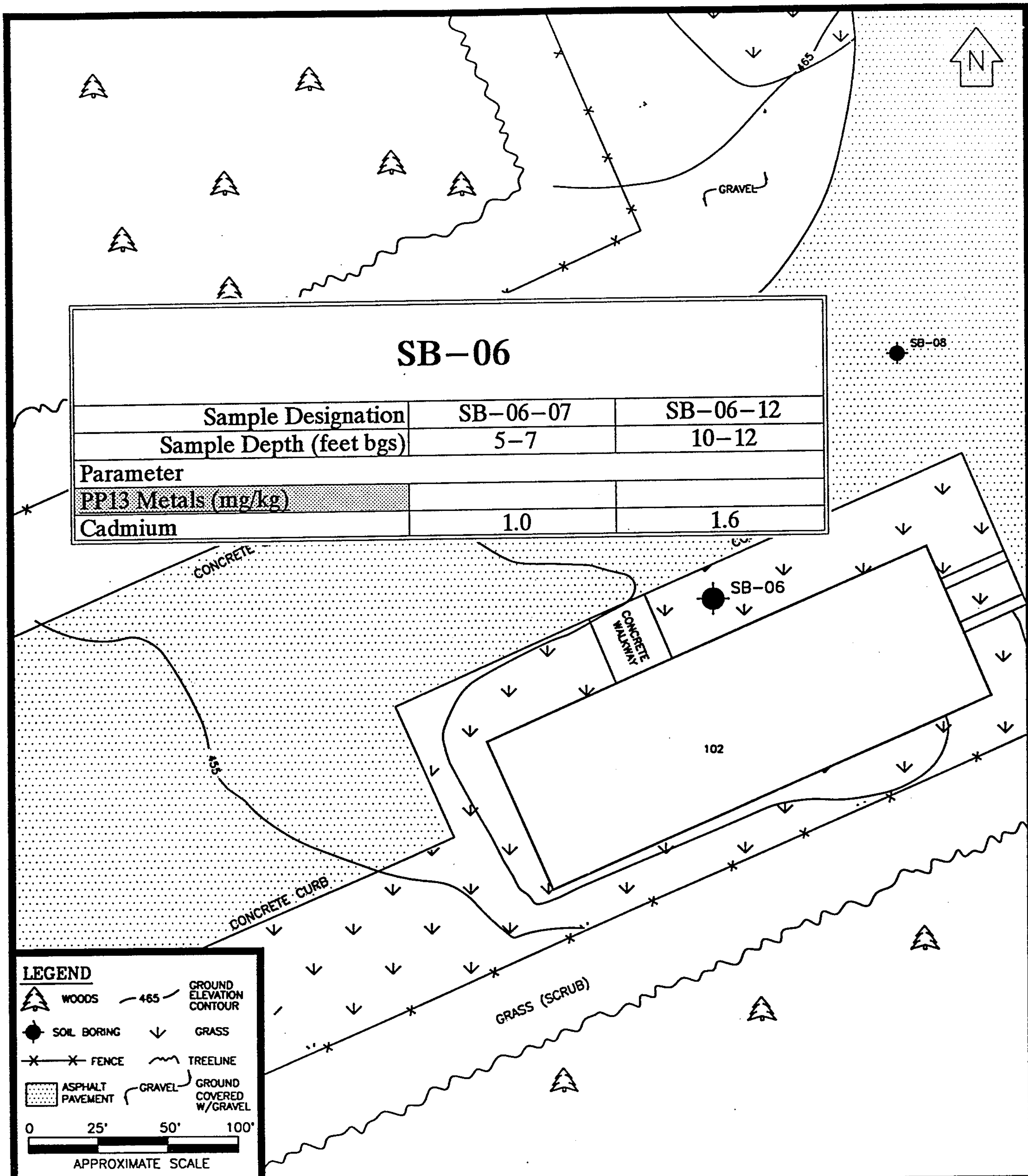
- The only inorganic compound detected above its reference criteria was cadmium which was detected at a concentration of 1.6 mg/kg in sample SB-06-12 and a concentration of 1.0 mg/kg in both samples SB-06-07 and SB-07-02.5. Cadmium was not detected in the background samples, and had a reporting limit of 0.67 mg/kg.

5.7.5.4 Conclusions

GC screening of the subsurface soil samples collected from soil borings SB-06 and SB-07 detected only the presence of total xylenes in sample SB-06-07 and SB-06-12. No identifiable compounds were detected in the sample collected from SB-07. Chemical analysis of the samples submitted to the off-site laboratory detected low levels of cadmium in all three samples. Although cadmium was not detected in the background sample, cadmium is not considered a site-related contaminant due to the low levels detected and the relative lack of detections of other compounds which would be expected to have been co-disposed of with cadmium. TPH was detected in sample SB-07-02.5 at a concentration well below the action level set for TPH of 100 ppm.

5.8 Monitoring Well Sampling

On December 13, 1994, Aneptek collected four groundwater samples, one from each of the four groundwater monitoring wells installed as part of this SI. All monitoring wells were developed approximately one week prior to sample collection. Each monitoring well was also purged a minimum of three well volumes immediately before sample collection.



SB-06

Sample Designation	SB-06-07	SB-06-12
Sample Depth (feet bgs)	5-7	10-12
Parameter		
PP13 Metals (mg/kg)		
Cadmium	1.0	1.6

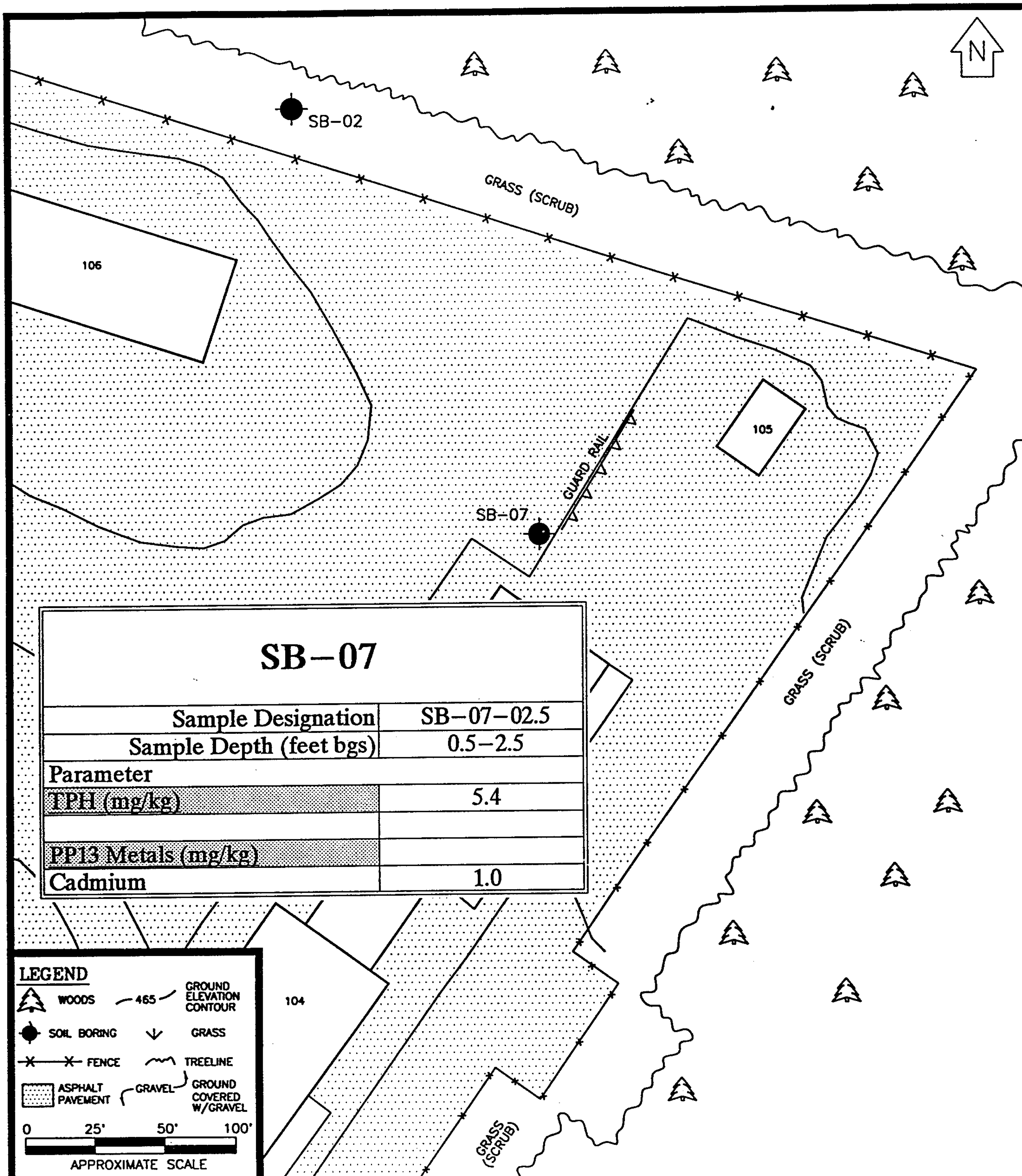
NORTH SMITHFIELD ANGS

ANALYTICAL RESULTS
SOIL BORING SB-06

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

FIGURE 5-23



SB-07

Sample Designation	SB-07-02.5
Sample Depth (feet bgs)	0.5-2.5
Parameter	
TPH (mg/kg)	5.4
PP13 Metals (mg/kg)	
Cadmium	1.0

NORTH SMITHFIELD ANGS

ANALYTICAL RESULTS
SOIL BORING SB-07

102ND AIR CONTROL SQUADRON
SLATERSVILLE, RHODE ISLAND

ANEPTEK CORPORATION
Analytic, Environmental and Process Technologies

FIGURE 5-24

5.8.1 Laboratory Analytical Results

Groundwater samples were submitted to the off-site laboratory for chemical analysis for VOCs, SVOCs, and TPH. Also, both filtered and unfiltered samples were collected and submitted to the off-site laboratory for PP13 metals analysis. Samples for each analytical fraction were preserved as described in the Final Work Plan (Aneptek, 1994a). Table 5-4 presents a summary of analytical results for the four groundwater samples.

Significant observations from the analysis of the samples collected include:

- No VOCs, SVOCs or TPH were detected in any of the four groundwater samples.

- Inorganic compounds detected in the sample collected from upgradient, background monitoring well, MW-02, include chromium, copper, lead, and zinc. None of these compounds were detected above Federal MCLs and action levels.

- The only inorganic compound detected in any of the filtered samples was zinc, detected in the filtered samples collected from MW-02 and MW-04 at concentrations of 0.027 mg/L and 0.056 mg/L, respectively. However, no MCL has been promulgated for zinc. A Health Advisory for a 10-kilogram child has been set for zinc at a concentration of 3.0 mg/L, well above the concentrations detected at the Station.

- No inorganics were detected in the either the unfiltered or filtered samples collected from MW-03.

- Analysis of the unfiltered groundwater sample collected from MW-04 indicated a chromium concentration of 0.053 mg/L. This concentration exceeds the reference concentration for chromium of 0.051 mg/L. This concentration does not exceed the MCL for chromium of 0.1 mg/L. This compound was not detected in the filtered sample collected at MW-04.

- Lead was detected in the unfiltered sample collected from MW-04 at a concentration of 0.023 mg/L. This concentration does not exceed the reference concentration of 0.039 mg/L for lead. However, this concentration does exceed the action level of 0.015 mg/L set for lead under the SDWA. Lead was not detected in the filtered sample collected from MW-04.

- Zinc was detected in the unfiltered sample collected from MW-04 at a concentration of 0.20 mg/L, which exceeds the reference concentration of 0.180 mg/L. However, as previously noted, no MCL has been promulgated for zinc, and a Health Advisory of 3.0 mg/L for a 10-kilogram child is well above the concentration detected in the sample from MW-04.

TABLE 5-4

GROUNDWATER LABORATORY ANALYTICAL RESULTS

Monitoring Well Designation	MW-01	MW-01*	MW-02	MW-02*	MW-03	MW-03*	MW-04	MW-04*
Screened Interval (feet bgs)	7-12	7-12	2.5-7.5	2.5-7.5	2.5-7.5	2.5-7.5	2.5-7.5	2.5-7.5
Parameter*								
VOCs	ND	NA	ND	NA	ND	NA	ND	NA
SVOCs	ND	NA	ND	NA	ND	NA	ND	NA
TPH	ND	NA	ND	NA	ND	NA	ND	NA
PP13 Metals								
Chromium	0.020	ND	0.017	ND	ND	ND	0.053	ND
Copper	0.011	ND	0.024	ND	ND	ND	0.038	ND
Lead	0.010	ND	0.013	ND	ND	ND	0.023	ND
Zinc	0.046	ND	0.060	0.027	ND	ND	0.20	0.056

Note: MW-02 is the background monitoring well.

* Indicates sample field filtered through a 0.45 micron filter.

SECTION 6.0

6.0 CONCLUSIONS

6.1 Conclusions Regarding AOCs

Based on the results of the GC screening performed and the confirmation sampling and analysis, all three AOCs appear to be relatively free of contamination.

6.2 Conclusions Regarding Other Areas

Based on the results of the GC screening performed and the confirmation sampling and analysis, all areas (other than the three AOCs), identified by the passive soil gas survey appear to be relatively free of contamination.

6.3 Conclusions Regarding TCE/TCA Contamination in the Station's Supply Wells

Upon reviewing all of the data generated during the field program conducted as part of this SI, no evidence of the presence of a TCE/TCA source area at the Station has been found. The following provides a discussion of the rationale used to support this conclusion.

If a source area were present at the Station which was contributing to contamination approximately 700 feet bgs (reported depth of the Station wells which are contaminated), relatively significant concentrations would be expected to be present in the subsurface soils at the Station. The characteristics of the compounds of interest, TCE and TCA, suggest that if a source area were present at the Station, these compounds would be readily detected by a soil gas survey. These compounds are highly volatile and would be present in the soil vapors rising to the surface. Due to the fact that the majority of the Station is covered with asphalt pavement, these vapors would tend to accumulate below the pavement, which in turn would be expected to result in higher concentrations of these compounds being detected during the soil gas survey. Only isolated detections of TCE and PCE were encountered during the soil gas survey. No detections of TCA were encountered.

The two locations identified to have the highest concentrations during the soil gas survey were investigated by advancing soil borings, screening subsurface soil samples with a portable field GC, and performing chemical analysis of the samples in an off-site laboratory. Neither GC screening nor laboratory analysis confirmed the presence of any chlorinated compounds at these locations.

Four isolated detections of chlorinated compounds were encountered during GC screening of subsurface soils. No more than one detection of one chlorinated compound in a single soil boring was encountered during GC screening. All samples for which GC screening identified the potential presence of chlorinated compounds were submitted to the off-site laboratory for confirmatory chemical analysis. No chlorinated compounds were detected during any of the

analyses performed by the off-site laboratory.

SECTION 7.0

7.0 RECOMMENDATIONS

7.1 Area of Concern A - Area North of Building P-13

No further action is recommended at AOC A.

7.2 Area of Concern B - Fenceline Behind the Motor Vehicle Maintenance Facility

No further action is recommended at AOC B.

7.3 Area of Concern C - Former Paint/Solvent Storage Building

No further action is recommended for AOC C.

7.4 Other Pertinent Information

7.4.1 Area Adjacent to Building 111

No further action is recommended for this area.

7.4.2 Area West of Building 108

No further action is recommended at this area.

7.4.3 Area Southeast of Building 107

No further action is recommended for this area.

7.4.4 Linear Area in the Central Portion of the Station

No further action is recommended for this area.

7.4.5 Soil Borings Advanced at Soil Gas Sampler Locations 24 and 36

No further action is recommended at these areas.

7.5 TCE/TCA Contamination in the Station's Supply Wells

No further investigation is recommended within the boundaries of the Station to address this issue. None of the data obtained during the field program indicates the presence of a potential source area of this contamination.

SECTION 8.0

8.0 REFERENCES

AEPCO, 1993. Preliminary Assessment, 102nd Air Control Squadron, North Smithfield Air National Guard Station, North Smithfield, Rhode Island.

Aneptek, 1994a. Final Site Inspection Work Plan for the 102nd Air Control Squadron, North Smithfield Air National Guard Station, Slatersville, RI, November.

Aneptek, 1994b. Field Logbooks Nos. 1 and 2, for field activities conducted at the North Smithfield ANG Station from October 6 to December 21.

Aneptek, 1994c. Telecommunication with Joanne Michaud, Rhode Island Department of Environmental Management.

Aneptek, 1994d. Telecommunication with Jack Kliever, USGS, Providence, Rhode Island.

Aneptek, 1994e. Telecommunication with Paul Dubois, Glendale.

Aneptek, 1994f. Telecommunication with Jim Decells, Slatersville, Rhode Island Water Department.

Aneptek, 1994g. Telecommunication with Paul Egan, Rhode Island State Census.

Aneptek, 1994h. Telecommunication with Vin Harrington, Rhode Island Department of Economic Development.

Aneptek, 1994i. Telecommunication with Rick Ensir, Rhode Island Department of Environmental Management.

Ramuglia (Aneptek), 1994a. Communication with Lt. Col. D'Agustino, RIANG, during kickoff meeting, June 16.

Ramuglia (Aneptek), 1994b. Communication with Capt. Berretta, RIANG, June 27.

Richmond, Gerald 1952. Bedrock Geology of the Georgiaville Quadrangle, Rhode Island, United States Geological Survey.

Richmond, Gerald, 1953. Surficial Geology of the Georgiaville Quadrangle, Rhode Island United States Geological Survey.

RIDEM, 1995a. Letters from Clare Stone, Senior Environmental Planner Division of

Water Supply Management, January 25 and 26.

RIDEM, 1995b. Letter from Joanne Mischaud, Data Manager/Environmental Planner, Natural Heritage Program, January 17.

Trow Protze, 1992. Summary of Remedial Activities, Rhode Island Air National Guard Electronics Communication Facility, prepared by Trow Protze Consulting Engineers, July 2.

U.S.DOC, 1961. Rainfall Frequency Atlas of the United States, United States Department of Commerce, National Weather Service, Technical Paper 40, Washington, D.C., 1961.

U.S. EPA, 1994. Drinking Water Regulations and Health Advisories, Office of Water, U.S. Environmental Protection Agency, November.

USGS, 1975. Topographical Map for the Georgiaville Quadrangle. 7.5 minute series.